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## ORIGINAL MEMOIRS.

### ANÆSTHESIA BY THE INTRATRACHEAL INSUFF- FLATION OF AIR AND ETHER.\*

A DESCRIPTION OF THE TECHNIC OF THE METHOD AND OF A PORTABLE  
APPARATUS FOR USE IN MAN.

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IN previous papers <sup>1</sup> I have considered the practical aspects of anæsthesia by intratracheal insufflation of air and ether, and have reported concerning several patients who were anæsthetized by the method of Meltzer and Auer. In a future paper I expect to report upon a number of intrathoracic operations performed by means of intratracheal insufflation, and upon our experiences with the method for purposes of artificial respiration.

This paper shall be devoted to the subject of the anæsthesia itself, with special reference to the technic of the method.

The apparatus for intratracheal insufflation should be as simple as possible and should be portable. While a very small and inexpensive apparatus worked by means of a hand pump

\* Read before the New York Surgical Society, November 23, 1910.

<sup>1</sup> Medical Record, March 19, 1910; ANNALS OF SURGERY, July, 1910; Berliner klin. Wochenschrift, October, 1910.

or a foot bellows could easily be devised, I have considered that an easily managed automatic apparatus would be much preferable, and have, therefore, with the help of Dr. S. Yankauer, of this city, and of Tiemann & Co., instrument makers, constructed the apparatus which is described in what follows.

The entire apparatus is contained in a wooden box which is  $38\frac{1}{2}$  inches long, 11 inches deep, and 18 inches wide. It is easily transportable (Fig. 1). The box is placed on the floor near the head end of the operating table and the front turned down<sup>2</sup> (Fig. 2), exposing the interior which contains the following (Fig. 3): By means of the switch *A* and the rheostat *B* the electric current is carried to the  $\frac{1}{4}$  horse-power motor *C* which drives the blower *D*. The air passes through the tube *E* and the oil filter *F* and the tube *G* into the bottle *H*. This bottle contains hot water, so that the air, as it bubbles through the water, is warmed, moistened, and filtered. The current of air then passes through the tube *I* to the rubber tube which is connected to the intratracheal catheter. To this tube (*I*) is connected the ether reservoir *J*.

The ether reservoir consists of a glass jar which is held air tight against its cover by a spring clamp below. The cover contains the openings of two tubes (*X*, *X'*) which are connected with the main tube *I*. The hand wheel *K* which moves an indicator on a scale above it, is arranged to control the air passing through the tube *I*. When the indicator stands at zero at the scale, pure air is passing through the tube *I*. As the indicator is turned, more and more of the air is diverted into the one tube (*X*) which leads into the ether reservoir. When full ether is turned on, all of the air has to pass into the ether reservoir and over the surface of the ether, so that it becomes saturated with ether vapor. When the indicator shows that pure air is passing through the tube *I*, the tubes which lead into the ether reservoir are closed, and the ether reservoir can be removed if necessary and refilled.

The manometer *L* is connected with the tube *I* and records the pressure of the air current which is flowing through it. The ends of the manometer tube have hard rubber stop-cocks which can be closed when the apparatus is to be transported,—a possible spilling of the mercury in the manometer is thus prevented.

The tube *M* leads into the main tube *G*, has also a stop-cock, and to its tip the tube from an oxygen tank can be connected so that oxygen can be added to the air if desired. The tube *P* leads to a foot bellows which has been added to the apparatus as a safety device, if anything should happen to the motor or blower, or is to be used where no electric current is available. When the stop-cock *N* is closed and *O* is opened,

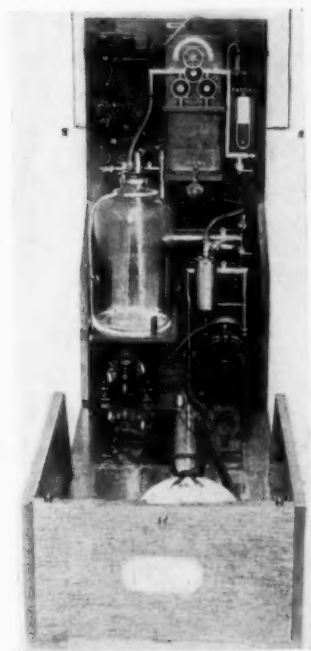
<sup>2</sup> The box is now arranged so that the front can be entirely removed.

FIG. 1.



Box containing insufflation apparatus.

FIG. 2.



Front of box turned down to show the apparatus.

FIG. 3.

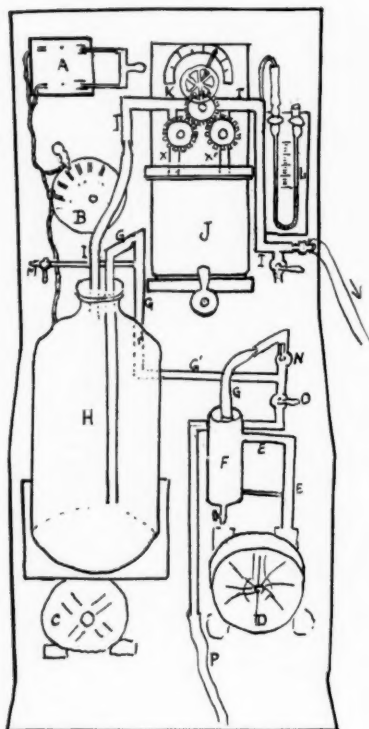
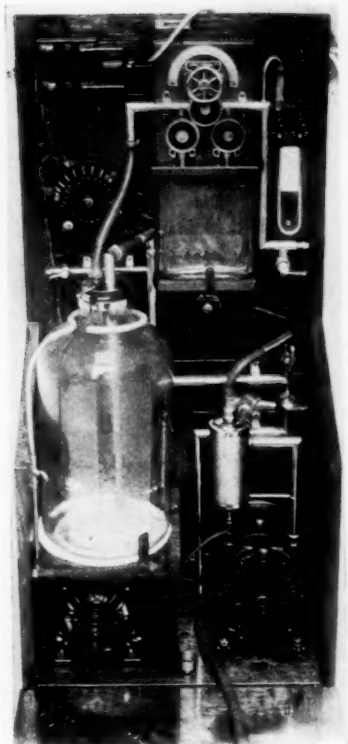


FIG. 4.



Front of box removed, showing the entire apparatus (excepting the foot bellows). The letters in Fig. 3 correspond to the letters in the text, and to the parts in Fig. 4.



and the foot bellows used, the air passes into the tube *G'* and into the water bottle. When the stop-cock *N* is open and *O* is closed, no air can enter the main tube from the bellows, and air passes to the water bottle from the blower. It takes only a moment to turn the two stop-cocks so that one can in a moment switch from air from the blower to air from the foot bellows and *vice versa*.

The water bottle *H* is held firmly in place by a clamp. The tubes from it are connected to the main tube by bayonet joints so that the bottle can be easily removed when it is to be filled or emptied. The perforated cork is held firmly and air tight by a clamp.

The apparatus and its handling are simple. When it is to be used, the water bottle is first one-third filled with hot water, the stop-cocks on the manometer opened, the stop-cock *N* open and *O* closed, the switch turned on, the rheostat turned on full, and the motor and blower thus set in motion. The stop-cock *M* is left wide open. As soon as the apparatus has been connected with the intratracheal tube the stop-cock *M* is slowly turned until the manometer shows that the pressure of the air is 20 mm.

The percentage of ether is regulated according to the depth of the anæsthesia; usually the indicator has to be turned until it shows that half or full ether is being used.

By means of the stop-cock at *I* (below the manometer) the air and ether current can be diverted from the intratracheal tube so that no air enters the intratracheal tube but all of it escapes through the open stop-cock.

The management of this apparatus is, as I have said, extremely easy. From the moment that the power is turned on and the pressure regulated, the anæsthetist has nothing to do but watch the pressure gauge and occasionally interrupt the current of air so as to momentarily collapse the lungs. He can be seated at some distance from the operating table and will be out of the way of the operator and his assistants; or he can be seated near the table so as to control the pulse of the patient.

*The Catheter or Tube to be Used, and the Method of Introduction.*—The tube which is to be introduced into the trachea must be fairly rigid so that it cannot be coughed out of the trachea when it is once in place. After much investigation I have found that this requirement is best met by a silk-woven catheter. It should have an opening at or near its end. It must be at least 30 cm. long. The ordinary silk-woven urethral catheter will do very well; this has the advan-

tage that it can be obtained anywhere. The catheter should have two marks upon it: one, 12 cm. from the tip, a second mark 26 cm. from the tip. The average length of the adult trachea is 12 to 13 cm., of the larynx, 5 cm.; in the adult, the average distance from the incisor teeth to the glottis is 14 cm. Therefore if the tip of the intratracheal tube is 26 cm. from the incisor teeth, it will lie 5 cm. or less above the bifurcation of the trachea.

The *size* of the catheter must, of course, vary with the diameter of the trachea and size of the larynx. For the adult it is advisable to use a tube whose diameter measures about one-half of the length of the glottis as seen through the direct laryngoscope. This will in general correspond to a size No. 22 to 26 of the French scale. In the majority of instances a catheter No. 22 or 24 French will be found of suitable size.

In children, the catheter must be correspondingly smaller. The length of the catheter in the trachea varies somewhat, but I have found that in general the length of tube below the glottis measures about the same as the length of tube from the glottis to the incisor teeth. In other words, if the tube has been introduced as far as the glottis, it will have to be pushed again as far downwards to have the tip in the proper part of the trachea.

*The Introduction of the Tube.*—After much investigation, I have found that the tube can be most easily and quickly introduced when the larynx is in plain view. This can be easily accomplished by means of the Jackson direct laryngoscope. As is well known, this instrument is used for the introduction of the bronchoscope. It is easy of manipulation, and with very little practice one can, by its means, obtain an admirable view of the glottis, so that the tube can be readily introduced between the vocal cords. For all of us who are not trained laryngologists this method will be found to offer the advantages of simplicity combined with certainty.

Before the tube is introduced, the patient should be given a dose of morphine and atropine and then be anæsthetized in the usual manner with ether. When the patient is well

under, he is brought into the operating room and placed upon the operating table, with the head hanging well downward over the end of the table and the mouth held open with an ordinary mouth gag.<sup>3</sup> The direct laryngoscope is then introduced and pushed along the posterior wall of the pharynx until the epiglottis is in plain view. The epiglottis is pulled well forward by the beak of the instrument and the glottis well exposed. One usually obtains a fine view of the larynx, can clearly see the opening between the cords, and can estimate its size and length. A catheter whose outside diameter measures about one-half of the length of the glottis is then selected. This is introduced through the laryngoscope and into and through the larynx. The tube is then pushed forward until the second mark on it shows that the tip is 3 to 5 cm. above the bifurcation of the trachea. Air will now be heard rushing in and out through the catheter. At this stage, the patient may have a spasm of the larynx for a few moments. This need not cause concern; respiration will soon begin again. The tube is now held in place and the laryngoscope withdrawn, the manipulations thus far having occupied only a few minutes.

To hold the tube in place, I first devised a special mouth gag or bit. It is called a bit because it is held against the upper teeth by means of a strap around the patient's head. It consists of a plate of hard rubber, held against the upper teeth, which has a central opening for the intratracheal tube. When the tube has been passed through the bit it is held immovable by a small steel spring clip, so that it (the tube) cannot be pulled out or pushed in. At the present time I use an elastic wire shaped to fit over the ears like a pair of spectacles. The wire runs just below the nose and has a small clip to hold the intratracheal tube.

The connecting tip of the tube which leads from the insufflation apparatus and from which the mixture of air and ether is flowing is now connected with the intratracheal tube, and

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<sup>3</sup> Preliminary cocaineization of the larynx is unnecessary.

the anæsthesia begun. By means of the stop-cock (*M*) the pressure is regulated so that the manometer registers 20 mm., and full ether is turned on. In many patients it is only necessary to keep the ether index at 50, in others full ether is required.

*The Course of the Anæsthesia.*—In all but one of the patients whom I have anæsthetized in this manner the anæsthesia was complete. That is, the patients were quiet, their musculature was relaxed, they breathed quietly and superficially. Auscultation of the mouth showed that the air was issuing from the buccal cavity in a continuous stream. In many but not in all of the patients the respiratory movements ceased altogether when the pressure was raised so that the manometer registered 30 to 40 mm., and apnœa ensued. It may well be that in some patients a pressure higher than 40 mm. of mercury is required to distend the lungs fully and thus cause the apnœa which is regularly observed in dogs when the lungs are markedly distended.

If the tube is of correct size and in the proper position, the face of the patient anæsthetized by intratracheal insufflation will be of a pink color with the veins of the forehead slightly prominent. The pulse is full, bounding, and regular.<sup>4</sup>

When the insufflation is begun, it often happens that the patient has a short attack of spasmodic coughing. Sometimes this seems to be due to the fact that the end of the intratracheal tube is too near the bifurcation of the trachea, and the cough will cease at once when the tube is withdrawn one or two centimetres. After a few moments, however, the coughing will cease of itself.

It is possible to keep a patient under primary anæsthesia for a long period of time, if the proper percentage of ether is given with the air. Several of the patients in whom abdominal operations were in progress had sensitive corneas, would

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<sup>4</sup>If the patient is cyanosed, it means either that the tube is not far enough in the trachea, or that too large a tube has been introduced. By the selection of the proper size of tube and its correct introduction both these accidents can be avoided.

open and close their eyes when ordered to do so, but remained perfectly relaxed and gave no evidence of pain sensation. These patients were almost fully awake as soon as the insufflation was stopped and the intratracheal tube removed.

There is an entire absence of mucus rattling in the throat during the entire period of the insufflation.

Most of the patients awaken very quickly when the insufflation is stopped; in a number of instances they would answer questions before they had been removed from the operating room. We have been accustomed to insufflate pure air for a few minutes at the end of the anæsthesia so as to blow out the anæsthetic from the lungs and trachea. So quickly, indeed, will the patient begin to react that one must be careful that the patient is receiving enough ether mixed with the air during the operation, otherwise he will begin to react before the operative manipulations are completed.

When the intratracheal tube is removed, there is often a very short period of apnoea, then regular deep breathing again begins.

I have carefully watched the patients when they have awakened from the anæsthesia. None of them had any cough or expectoration at any time, and none had any pulmonary complication of even the mildest kind after the operation.<sup>5</sup> As soon as the patients were awake, they spoke freely, were not hoarse, and did not complain of any pain in their throats. I have asked every one of them whether they had any feeling of discomfort in the region of their larynx, and have thus far received a uniform answer in the negative. Further data (with perhaps laryngological examinations) will have to be gathered in the future.

There is one other feature of the post-operative course which can receive only preliminary mention here. We have observed that post-operative vomiting was conspicuously absent in our patients. The total number of anæsthesias given

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<sup>5</sup> This does not, of course, apply to the patients who were operated upon for pulmonary abscess or who had a pulmonary lesion before the operation.

is far too small to allow of any definite statements in this regard, and I should not have mentioned this fact at all, if my attention had not been especially called to it by the nurses and the house staff who had charge of the patients.

We have thus far anæsthetized about 30 patients by intratracheal insufflation. Some of them were operated upon for intrathoracic disease, many for abdominal or other affections. As soon as we had convinced ourselves of the safety of the method we felt justified in using it on any patients who had to be anæsthetized, and we have thus collected valuable data as to the method, the technic of intubation, etc. We have found the anæsthesia very useful in operations on the head and neck, as the anæsthetist was never in the operative field or in the way of the operator or his assistants.

## INTUSSUSCEPTION, WITH SPECIAL REFERENCE TO ADULTS.\*

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THE discussion of changes in peristaltic activity leading to the development of intussusception and the results of observation in physiological laboratories of a symmetrical stimulation of different segments of the intestinal tract have been so fully presented by different writers that further consideration of that part of the subject is unnecessary.

While intussusception in infants and children is carefully and exhaustively described in both text-book and in the current literature, the consideration of the same lesion in adults is almost universally neglected. That intussusception in adults is uncommon cannot be denied, but the fact that it is sufficiently frequent to warrant careful consideration is amply proved by an analysis of the cases admitted to the service of any general hospital in a stated period of time, such as 20 or 25 years. Such a tabulated list of 115 cases from the records of St. Thomas's Hospital in London, from 1875 to 1900, was published by Pitts in the *Brit. Med. Journal* (1901, 2, page 574), and of these about 10 per cent. occurred in adults over fifteen. In a similar series of 59 cases observed in the *Scot. Med. and Surg. Journal*, 1906, xix, during a period of 10 years prior to 1905, reported by McGregor, four were in adults over twenty-one. Codman, in the *Boston Med. and Surg. Journal* for 1908, 158, pages 439-446, states that of 27 cases of intussusception in the Massachusetts General Hospital dur-

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\* Read before the New York Surgical Society, October 26, 1910; read before the Western Surgical Society, December 20, 1910.



ing the ten years prior to 1908, nine occurred in adults. In this connection the older statistics of Leichtenstern (*Prag. Monat.*, 1874), based upon the study of more than 500 cases and showing a percentage of 45 in adults, must be discarded, for they were evidently gathered from current literature at a time when intussusception in infants was frequently unrecognized or discovered only at autopsy, and similarly the statistics of Gibson published in the *Med. Record* for 1897, in which of 239 cases, 60 occurred in adults over seventeen, are of comparatively little value in demonstrating the relative frequency of intussusception in adults and children.

Of very considerable interest is a comparison of what may be termed the exciting causes in children and in adults. In the former the different kinds of acute intestinal disturbance resulting from improper food preponderate. In infants any inflammation or other pathological change in the vermiform appendix contributes very slightly if at all to the development of intussusception. In young children, however, the writer has collected 18 instances between the years of two and seven in which an inverted appendix was probably the cause of a cæcal intussusception, while only three instances of the same condition could be found in adults.

Trauma is frequently mentioned as a possible cause of intussusception. In infants it obtains only in the sense that the muscular effort of crying and straining unquestionably increases a pre-existing intussusception, and may even be considered responsible for its initial formation. In adults, on the other hand, trauma is infrequent, and even when mentioned as a cause may, by some, be regarded as a mere coincidence. Moreover, it is not always received in the same way. Usually a history of some sudden excessive exertion, as in heavy lifting, is said to have directly preceded the onset of the acute obstruction, while less frequently the intussusception is ascribed to a blow on some part of the anterior abdominal wall. In Case 163, that of an actor in vaudeville, the patient had daily held a number of men on the rigid abdomen. After one of these performances, acute obstruction developed, and



operation disclosed an intussusception due to an inverted Meckel's diverticulum with a subserous lipoma at its apex, an unusual combination of three so-called exciting causes. A lateral anastomosis after resection was done, and on recovery the patient was advised to change his occupation. In a number of instances such as the preceding, trauma might be regarded as a contributing cause, for either benign neoplasm or a Meckel's diverticulum might alone be responsible for an intussusception. This interpretation must obtain in Case 49, in which after a fall on the left side a subserous lipoma was found at the apex of an intussusception. In the three following cases, however, no cause was found either at operation or at autopsy, and the previous history of trauma assumes a correspondingly greater importance. In Case 25 wrestling had preceded an intussusception, which terminated fatally from peritonitis after the discharge of a necrotic intussusceptum from the bowel. A similar case, No. 37, may be cited, in which a slough composed of the transverse colon was discharged from the bowel after an obstruction of a week's duration, preceded by a history of lifting a heavy weight. In Case 193, an enteric intussusception, a history of playing football is mentioned. An analysis of the 300 cases cited in this paper gives 23 instances in which some form of trauma was associated with the intussusception, and a glance at Table I shows that, of all the different forms of trauma, that one in which there is some form of violent muscular exertion is by far the most frequent.

TABLE I.

Trauma, not classified .....	2
Blow .....	2
Crush .....	1
Fall .....	3
Violent muscular movement, football (1), riding (2)....	7
Lifting heavy weight .....	7
Puerperium .....	1
Typhoid .....	5
Dysentery .....	6
Tuberculosis .....	5
Simple inflammatory ulcers .....	3

Tumors of the intestine are a comparatively frequent cause of intussusception in adults, occurring rarely in infants and children. Of the 300 cases here cited, there were 60 instances of benign tumor and 40 instances of the malignant type. Of the former class, the majority had their origin in the inner layers of the intestinal wall, usually by a constricted or pedunculated base, and projected into the lumen, forming by that means a more natural form of irritation than the less frequent growths which were subserous and projected toward the peritoneal cavity. Histologically, polyp, lipoma, myo-adenoma, fibroma, myxofibroma, myofibroma, myxoma, cyst of the ileocaecal valve, and papilloma are all mentioned, the polyp being the most frequent and occasionally multiple. In four instances the benign tumor was associated with a Meckel's diverticulum: in Case 152, a fibrous polyp at its apex; in Case 151 a similar growth in its interior; in Case 163, a subserous lipoma at its apex, and in Case 97 a plum-sized fibrous tumor near its base. In almost every instance, the tumor occupied the apex of the invagination, but in Case 96 it was at its base, a situation in which the question of its being an exciting cause might well be open to argument.

The malignant growths include different varieties of carcinoma, sarcoma, myxosarcoma, melanotic epithelioma, and in Case III a sessile polyp in the sigmoid which had become malignant. The location of the growth may be studied in Table II. No part of the alimentary tract seems to be immune, but as is the case with growths of the intestine independent of intussusception, benign varieties are more frequent in the small, while malignant growths more frequently invade the large intestine. Moreover, attention may be directed to the fact that intussusceptions occurring in connection with benign growths in the large intestine are situated in either the sigmoid or rectum.

Ulceration of the intestine other than that associated with malignant growths is a well-recognized cause of intussusception in adults. Ulceration associated with typhoid fever, dysentery, tuberculosis, and simple ulcers possibly of stercor-

raceous origin preponderate. The writer has reported in vol. xxiv of the *Transactions of the American Surgical Society* a case of enteric intussusception associated with the convalescent period of typhoid fever in a young girl of seven. A study of the 300 adult cases here reported shows 5 instances of intussusception due to typhoid ulceration, 6 instances of intussusception in connection with dysenteric ulcers, 5 instances of intussusception associated with tuberculosis, and at least 3 instances of intussusception associated with what are described as simple inflammatory ulcers. In intussusception due to tuberculosis, the lesion may be a tuberculous infiltration of the serosa or subserosa of the intestine without ulceration of its mucous membrane.

TABLE II.

	Benign.	Malignant.
Enteric, not stated .....	4	3
Duodenum .....	0	1
Upper jejunum .....	1	0
Lower jejunum .....	0	0
Not stated, jejunum .....	4	2
Upper ileum .....	0	1
Lower ileum .....	5	1
Not stated, ileum .....	5	2
	—	—
Total .....	19	10
Ileocæcal valve .....	13	9
	—	—
Total .....	13	9
Colon, not stated .....	5	2
Ascending colon .....	0	1
Transverse colon .....	0	0
Descending colon .....	2	0
Sigmoid .....	6	5
Rectum .....	1	1
Cæcum .....	3	9
	—	—
Total .....	17	18

Meckel's diverticulum is associated with intussusception in both adults and children. In 29 cases of this particular variety, 15 occurred in patients under ten, five between 10 and

20, four between 20 and 30, and four in patients between 30 and 49, and in one the age is not given. In the different varieties of acute obstruction directly due to this appendage without intussusception, a similar age relationship obtains and cases occur even as late as in the sixth decade. The exact nature of the irritation which brings about the initial inversion of a diverticulum in intussusception is rather difficult of explanation. Reference has already been made to the occasional presence of a polyp or other benign growth in this connection. In the majority of cases, however, in irritation or inflammation from inadequate drainage of its secretion lies the probable explanation of this unusual lesion.

Foreign bodies within the alimentary canal, impacted or free, rarely cause intussusception. In Case 33, however, a rusty darning needle and in Case 180 a date stone may have been contributing factors.

Some writers believe that intussusception may be due to the irritation of intestinal parasites such as ascarides or lumbricoides. Whether the presence of such parasites is a mere coincidence or an actual contributing cause is largely conjectural.

Attention is directed to a considerable number of acute, subacute, or chronic cases of intussusception in which no cause is mentioned. That cases occur without discoverable cause must be admitted. On the other hand the lack of mention of a cause is not infrequently due to omissions in the published report of the case.

The uniformity of the clinical picture of intussusception in infants and young children has been emphasized by Clubbe, Codman, and many other writers. In this group of cases the symptoms, both local and constitutional, are so characteristic that a correct diagnosis should be promptly made. On the other hand, that the clinical picture of intussusception in adults varies widely is well illustrated in the histories of the following cases in both of which the cause was a polyp attached to the intestinal wall by a constricted base. As a matter of fact the great contrast presented by these histories suggested

to the writer the desirability of investigating the subject of acute intussusception of adults as a whole, with the object of arranging if possible the different groups into which, in accordance with their varied courses, the cases might justifiably be divided.

CASE I.—Male, aged forty. Referred by Dr. Ferguson.

Ever since childhood and until a short time ago patient has suffered from occasional abdominal cramps; three or four months ago patient was seized by slight cramp-like pains in the left lower quadrant occurring either before or after eating. They were of from 10 to 15 minutes in duration and were relieved by simple measures. Twenty-nine hours ago, patient was seized by a sudden, severe, cramp-like pain in the left lower quadrant, which did not radiate. Shortly after the onset the bowels moved spontaneously, the movement consisting of blackish material. At the same time vomiting occurred and has been repeated at frequent intervals up to the time of admission into the hospital. About eight hours after the invasion, patient felt a hard lump in the right lower quadrant, which shortly afterward moved to the left side. The tumor and its change in position was confirmed by the family physician. In addition there was a history of the frequent passage of mucus and blood from the rectum.

Physical examination on admission to the hospital showed that the abdomen moved with respiration. There was a localized distention in the midumbilical region extending more to the right than to the left side. On palpation, two loops of elastic distended intestine, separated by a groove, could be distinctly felt in the distended area. These loops were movable from side to side and tympanitic on percussion. The overlying abdominal wall was moderately rigid. There was slight dulness in the flanks half way up to the navel. There was no evidence of increased or focal peristalsis. Apart from the presence of blood and mucus in an enema, examination of the rectum was negative. The temperature was 100°, the pulse 92, and respiration 22. The general condition appeared excellent.

Under anæsthesia, an incision was made along the outer border of the right rectus muscle, and on opening the peritoneal cavity a small amount of serous fluid issued from the wound. The distended loops above mentioned proved to be those of an

enteric intussusception, which was about 12 inches long and curved like an enormous sausage upon its mesenteric axis. It was completely irreducible. A resection of what proved to be about four feet of small intestine was then carried out, and the divided ends united by circular suture. The abdomen was closed without drainage. The patient reacted well from the operation and recovered without complication. An examination of the intussusception showed a polyp about the size of an English walnut at the apex of the invagination. The intussusciens was in a condition of incipient gangrene and the mesenteric veins were thrombosed.

CASE II.—Female, aged sixty-seven. Referred by Dr. Niesley.

Patient has always enjoyed excellent health until four months ago, when she suffered from several attacks of epigastric pain and vomiting. These quickly subsided, and patient was quite well until several weeks before her admission into the Nassau Hospital, when the epigastric pain recurred and, on abdominal palpation, a mass was found occupying the position of the transverse colon. This mass was doughy, insensitive, and, owing to a long pre-existing constipation, was supposed to be due to a possible fecal impaction. A high enema was given and the mass almost totally disappeared, only a small portion remaining in the right lower quadrant. At the same time the enema brought away only a small amount of ordinary fecal material. From time to time recurrence of the tumor took place, always without pain and without discomfort to the patient, only to disappear with an enema or after abdominal massage. At no time was there even subacute obstruction and operation was delayed merely with the idea of improving the patient's general condition. Rectal examination was negative.

Under ether the peritoneal cavity was opened by a right pararectal incision and the intussusception exposed. It was of the ileocolic variety and extended as far as the splenic flexure. Disinvagination was quickly accomplished until the cæcum was reached, and with a little pressure something was felt to slip through the ileocaecal valve and for a distance of six inches above it. From this point the intussusception, about six inches in length, was totally irreducible and was resected, followed by end-to-end suture. After the removal of the appendix, which was



oedematous and thickened, the abdomen was closed without drainage, the patient making an excellent recovery. Examination of the specimen removed showed a polyp the size of a lemon and attached by a constricted base to the apex of the invagination.

Through the courtesy of the gentlemen mentioned below I am permitted to present notes of five more hitherto unpublished cases.

CASES OF DR. JOHN GIBBON, Philadelphia, Pa.

CASE III.—A male, aged fifty-eight, was operated upon in the Presbyterian Hospital July 27, 1900, after a history indicating intestinal obstruction. He was in bad condition when operated upon. Eight to ten inches of the ileum had passed into cæcum and could be withdrawn. Three feet eleven inches of ileum were resected to get above gangrenous portion. The end of small bowel and cæcum opening were sutured in the wound. Drainage. Death on the same day.

CASE IV.—A male, aged nineteen, previously in good health, his bowels having moved twice that morning, was seized by sudden severe abdominal pain and vomiting. The pain gradually became worse and several hours later he consulted Dr. Graham, who gave him a hypodermic and could distinguish a mass in the right lower quadrant when the boy became quiet. Seen by Dr. Gibbon shortly afterward, at Dr. Graham's office, patient was pale and without pain. Temperature was subnormal, abdomen was scaphoid and a little rigid. In the right lower quadrant was a distinct, oblong, slightly tender and movable mass. One hour later temperature was subnormal and mass was thought to have changed somewhat. Operation was refused until next day. Enemata had been ineffectual, and vomiting had occurred several times. There had been no tenesmus or rectal bleeding.

Operation 24 hours after onset. Under ether anæsthesia examination showed that mass had moved further up on right side. Through incision, through right rectus sheath, presented a large intussusception. Reduction was impossible. Incision made through ant. long. band of colon, which was filled with bloody exudate and 18 inches of ileum. It was impossible to draw ileum further into lumen of large bowel for purposes of resection. The contained ileum was tied off inside colon near

ileocolic junction, and two rows of sutures applied outside to prevent leakage. Lateral anastomosis between ileum and colon was made, utilizing the slit in the colon. Catgut was used for all inner rows of sutures and linen on the outside. Bowel was washed with saline and iodoform drainage was inserted.

Post-operation, a small quantity of flatus and bloody fecal matter was passed. There was a short post-operative rise of temperature. Feeding was begun immediately and convalescence was uninterrupted.

Cases of DR. W. J. MAYO, Rochester, Minn.

CASE V.—In an adult having colicky symptoms for several months. There was an adenofibroma in the ileum.

CASE VI.—Age fourteen, with no previous symptoms; there was a myoma 6 inches above ileum into cæcum and ascending colon. Both cases recovered after resection.

Case of DR. JAMES E. MOORE, Minneapolis, Minn.

CASE VII.—Age twenty-five, had repeated attacks of colic through several years, diagnosed appendicitis. Present attack 24 hours. Variety, ileum into colon about 18 inches. Condition, dark color of both outer and inner coats but no gangrene. Operation, reduction and resection of a Meckel's diverticulum. Result, prompt cure. Patient had one attack of colic after the operation.

Returning to the above-mentioned classification, we find that Table A, including cases of intussusception associated with benign tumors, is the largest, comprising one-fifth of all cases here tabulated, and may be divided into four groups as follows:

(a) Those in which, as in the first case reported, the onset of the obstruction is acute and without warning, the patient having previously enjoyed perfect health.

(b) Those in which the acute onset is preceded by a history of previous attacks of obstruction relieved without operation, or a history of chronic constipation, indigestion, or of both extending over many years, or a history of intermittent attacks of colic with or without vomiting, concurrent with constipation and separated by intervals of complete freedom from all abdominal discomfort.



(c) An infrequent group in which the intussusception is essentially chronic, without marked pain, with no vomiting, and with only moderate constipation easily relieved by enema. The second patient herewith reported belongs to this group.

(d) An occasional group comprises those patients who give a history simulating some other abdominal lesion, in whom the intussusception is discovered only in the course of an exploratory laparotomy. Thus, in Case 80, symptoms of three years' duration pointed either to cholelithiasis or peptic ulcer, yet on operation an enteric intussusception with a polyp at its apex was discovered and removed.

Of the patients suffering from this form of intussusception, the youngest was fifteen with the exception of Case 52, a male of four reported by Brunner, in which the cause of the intussusception is given, "as an accessory pancreas in the blind end of a diverticulum forming a pedunculated tumor in the lower ileum." The oldest occurred in a patient of eighty-four and it is worthy of note that in four patients over seventy, three polyps presented in the rectum and the fourth in the descending colon.

The fragmentary way in which a number of these cases are reported renders useless the computation of any percentages of individual symptoms, such as abdominal tumor, the frequency of rectal discharges of blood and mucus, the absence of constipation, the frequency of vomiting, etc. In 22 cases the presence of an abdominal tumor is mentioned; in one no tumor could be detected. In the remainder no statement regarding the presence or absence of a tumor is made. In 15 cases note is made of the discharge of either blood or mucus; of the remainder only in one is it mentioned that rectal examination was negative. It is worthy of note in this connection that in at least two cases, Nos. 52 and 67, the discharge of blood from the rectum was sufficiently abundant to constitute actual hemorrhage. Attention should also be directed to the occasional mention of rectal tenesmus. This symptom is evidently most frequently associated with benign growths below the level of the splenic flexure.

Table B includes 40 cases of intussusception with malignant tumor, which may be conveniently divided into the following groups:

(a) Those in which the onset is acute, occurring without warning in patients who have always enjoyed excellent health. Such cases are uncommon; Case 141, an enteric intussusception due to multiple sarcoma with mesenteric glandular involvement, may be cited as an example. In Case 119, symptoms of acute appendicitis were followed after ten days by those of subacute obstruction in what proved to be an intussusception associated with a sarcoma of the ileum.

(b) In this group the development of the intussusception is preceded by a history of a primary growth, usually sarcoma, in some distant part of the body.

(c) By far the most frequent are cases belonging to this group, in which the symptoms pointing to an intussusception are preceded by those due to malignant stricture. In cases of this character the obstruction due to the intussusception is essentially chronic, and in its later stages cannot easily be distinguished from the terminal obstruction so frequently seen in malignant stricture of the large intestine. The alternating constipation and diarrhœa, the blood and at times pus in the stool, the presence of focal distention and of visible peristalsis, together with the recurrent attacks of subacute obstruction, relieved by enemata, are all classic symptoms of that condition. It is only by the discovery of the characteristic tumor that the diagnosis of intussusception can be made, and even then the diagnosis may be erroneous, since the tumor may be due to a temporary fecal impaction on the proximal side of the stricture.

Table C comprises those cases of acute intussusception either without discoverable cause or at least without the mention of any cause in the history. They may be conveniently divided into two groups:

(a) Cases with acute onset, without warning, in patients previously healthy.

(b) Cases with acute onset, preceded by a history, ex-

tending over weeks or months, of some abdominal disturbance. Of this group Case 213 may be cited, in which the patient suffered from intermittent attacks of sharp colicky pain for six months prior to operation for an irreducible enteric intussusception, three feet below the pylorus. The patient, a woman of fifty, died shortly after the resection of the invagination and the suturing of both ends of the divided intestine into the abdominal wound. Case 218 is also of interest. The patient, a male of twenty-two, gave a history of three attacks of acute cramps of short duration, with the formation of a tumor occurring within the three weeks prior to the operation. On each day there was diarrhoea, and at operation an ileo-cæcal invagination extending to the splenic flexure was found. The patient made an excellent recovery after resection followed by end-to-end suture.

Table D comprises those cases of acute intussusception, exclusive of tumors, in which some other specific cause was found. They may conveniently be divided into two groups:

(a) Those with an acute onset preceded only by the symptoms of the actual exciting cause.

(b) Those in which the acute onset is preceded by a history of some abdominal disturbance. Of this type Case 190, in which the patient suffered from two attacks of abdominal pain 16 years and 10 weeks prior to the invasion of the intussusception, seems to be the only example. At operation an intussusception was found with a well-defined ulcer at its apex. On the other hand, Group *a* includes cases following various kinds of trauma (which have already been discussed under the etiology), cases occurring in connection with typhoid fever (one on the twenty-fifth, two on the twenty-sixth, one on the fortieth day, and one during convalescence), and a case associated with colitis.

Table E comprises those cases of subacute and chronic intussusception for which no cause is mentioned in the history. In nearly all the cases of this group of which the history is not fragmentary, there is a story of intermittent attacks of colic, with the appearance of a tumor or of a distended loop

of intestine, which in many instances are noted by the patients themselves.

Table F comprises cases of subacute or chronic intussusception, in the histories of which a distinct cause is mentioned, and may conveniently be divided into two groups:

(a) Those in which the actual cause is recognized prior to the operation, including cases of chronic intussusception associated with dysentery or persistent typhoid or tubercular ulceration. In this group the symptoms and physical signs of intussusception modify those which are due to the pre-existing lesion.

(b) Those in which the actual cause is revealed only by the operation or autopsy. This group includes cases of chronic intussusception associated with subserous tubercular infiltration of the intestine, as well as those due to chronic ulceration of the cæcum or colon which is probably of stercoraceous origin. In this group the history does not differ materially from the history of a case of chronic or subacute intussusception in which the actual cause can never be ascertained.

Table G includes all cases of intussusception, irrespective of the age of the patient, due to Meckel's diverticulum. These may conveniently be divided into two groups:

(a) Those in which the invasion is acute without previous history of abdominal trouble.

(b) Those in which the invasion of the terminal obstruction is preceded either by one or more attacks of obstruction which have subsided spontaneously, or by some other minor abdominal or digestive disturbance. Thus in Case 170, in a woman aged thirty-nine, there was a history of attacks of subacute obstruction occurring several times in the course of each year for a period of 12 years. In Case 162, on the other hand, there was merely a history of poor digestion with occasional colic, and in Case 145 a history of sudden unexplained hemorrhage from the bowel one month before the symptoms of acute obstruction appeared.

Considerable variation is also observed in the individual symptoms of the acute terminal obstruction in intussusception

due to Meckel's diverticulum. While complete constipation is the rule, either the passage of one or more normal stools or actual diarrhoea is not an infrequent exception. Blood and mucous discharges from the bowel are mentioned in six cases, once with tenesmus. In four instances it is stated that neither blood nor mucus was discharged from the rectum, and in the remaining 13 cases no mention is made of this symptom. The presence of a tumor was almost always observed.

The clinical course is usually exceptionally severe. In fact analysis of the cases of this lesion shows that the inverted Meckel's diverticulum is, with but two exceptions, irreducible, and that gangrene of the intussusception occurs so promptly that early operative interference is urgently demanded.

In all the different forms of intussusception, both acute and chronic, and irrespective of the actual contributing or exciting cause, the presence of an abdominal tumor and its variation in size, position, and consistency, either during or independent of the attacks of colicky pain, are especially characteristic. The clinical picture of a tumor quickly appearing or increasing in size during the attacks of colic, and disappearing or decreasing in size with their cessation, renders the diagnosis of intussusception certain. The writer has referred in a previous paper to the fact that the overlapping of the spleen or liver may conceal an intussusception at the hepatic or splenic flexures of the colon, and also to the fact that an intussusception gravitating or moving into the depths of the pelvis may be especially difficult to palpate. The possibility of such contingencies emphasizes the importance of making a bimanual examination in either ileocostal space as well as through the rectum, by means of which, either with or without the assistance of an anæsthetic, the tumor mass may usually be detected. The writer wishes also to emphasize the increase in the consistency of the mass formed by the intussusception, either with the advent of a cramp or even as the result of the mechanical stimulation in the course of routine palpation. This change in consistency, although it does not always occur, differentiates the tumor of an intussusception from either a neoplasm or a fecal impaction.

The presence of an abdominal tumor, together with the similarity of the symptoms of the two conditions, accounts for the occasional confusion of intussusception with appendicitis. A correct diagnosis is usually possible by noting that the tumor associated with appendicitis is almost invariably fixed and enjoys little if any respiratory movement. Moreover, the associated muscular rigidity is of great importance. In appendicitis it is almost always most marked in the lower right quadrant, while in intussusception the symptom, if present, is generally more marked to one side or the other of the umbilicus, while the intervening abdomen between this area and either inguinal region is either less rigid or entirely free from any rigidity whatever. This proved to be the fact in the first case reported in this paper. Both iliac and both hypochondriac regions were free from rigidity, and although the enteric intussusception was of 28 hours' duration, the abdominal wall over the large tumor was not sufficiently rigid to interfere with its satisfactory palpation.

The course of acute intussusception in adults is more prolonged than in infants or children. The latter quickly succumb to the intestinal toxæmia, the result of obstruction, before the advent of peritonitis. In adults, on the other hand, the course may be so protracted that, the intussusciens remaining viable, the obstruction may be relieved by the spontaneous discharge of the necrotic intussusceptum through the rectum. Of the 43 cases of this character included in Table H only three occurred in patients less than four years old. The remainder include cases of intussusception associated with Meckel's diverticulum, with benign tumors, and many others in which the actual cause could not be recognized in the discharged slough.

It is self-evident that, owing to the primary risk, the possibility of relief through the discharge of the necrotic intussusceptum should not encourage conservative measures in the treatment of this condition, and it is emphasized by Raven, as well as shown by a study of the end results in the additional cases reported in Table H that, although temporary relief is usually afforded by nature's method, yet within 18 months and usually much earlier, secondary obstruction develops from cica-



tricial contraction at the point of the original invagination and is rapidly fatal. Such an unfortunate termination appears so common that, after the subsidence of the abdominal symptoms associated with the discharge of the slough in these neglected cases, the writer suggests the advisability of providing against the contingency of subsequent obstruction by establishing a lateral anastomosis between the intestinal canal on either side of the site of the invagination.

The principles which govern the treatment of intussusception in adults do not differ essentially from those in children. The fallacy of palliative measures is just as pronounced in the one as the other, although, owing to their greater resistance, the risk incurred by delay in adults is not as great as in children. It must be admitted that in both a temporary if not a permanent reduction is sometimes effected by rectal injections of either air or water. On the other hand, at the expense of possible repetition, it must be emphasized that experience has amply demonstrated that the disappearance of the tumor as a result of either of these measures of treatment may mean but partial disinvagination and that, after a brief respite, the symptoms of acute obstruction may recur with renewed virulence, the tumor being again palpable through the abdominal wall or rectum, and the general condition of the patient, especially in an infant, less capable of overcoming the shock of inevitable operation.

The earlier the operation in infants the easier and the more quickly accomplished is the disinvagination, and if this takes place within the first 12 or even 24 hours after the onset of obstruction, the total operative time should not exceed from 10 to 15 minutes. Under such favorable conditions the chances of recovery, even in a young infant, are excellent.

With the exposure of the intussusception, disinvagination is to be accomplished by a combination of expression and traction. In the paper already referred to, the writer has called attention to the danger of rupture of the intestine if dependence is placed upon either of these measures alone. Usually in the first stages of reduction, expression only is necessary. In the last part of reduction, however, in which the greatest difficulty

is experienced, a combination of both measures is indicated. With the completion of reduction when that has proved feasible, the cause of the intussusception is to be removed if possible; thus a Meckel's diverticulum or an appendix may be resected, while a benign tumor may be removed through a linear incision of the intestinal wall or even, as is always the case with a malignant growth, by complete resection. The cause having been removed, a recurrence of the intussusception is best prevented by anchoring the affected loop to the lateral parietal peritoneum. This method is more reliable and can be more quickly accomplished than the reefing of the mesentery, than the more radical measure of resection of the affected loop, or the ingenious reefing of the large intestine suggested by Passagi (Case 292), in which two parallel rows of Lembert sutures are placed on either side of its anterior longitudinal band (endoplication of the cæcum).

TABLE III.

	No.	Cured.	Died.	Not stated.
Resection .....	84	41	34	9
Splitting sheath and resecting intussusceptum from within ....	9	7	2	
Partial reduction followed by resection .....	18	11	5	2
Reduction complete, resection of tumor or Meckel's diverticulum	17	6	7	4
Reduction complete, resection for stricture or to prevent recurrence .....	2	1	1	
Reduction .....	37	23	7	7
Bimanual reduction (one hand in bowel) .....	2	2		
Attempted reduction, tear, resection .....	10	3	7	
Ileocolostomy, entero-enterostomy .....	13	5	6	2
Enterostomy .....	4	1	3	
Enterotomy .....	1	1		
Resection and removal rectally...	5	3		2
Incision of constricting band, reduction .....	3	2	1	
Artificial anus .....	12	1	8	3
	—	—	—	—
	217	107	81	29



The treatment of irreducible or gangrenous intussusception depends upon the condition of the intussusciens and the intussusceptum. If both are necrotic, resection is imperative. In infants of less than a year, such a drastic measure is usually fatal but is without alternative. The subsequent continuity of the intestine must be established in the quickest possible way, for a temporary enterostomy rarely improves the infant's condition. In adults, on the other hand, a temporary enterostomy is frequently of great advantage, if not situated too near the pylorus, the subsequent anastomosis being done after the symptoms of the acute obstruction have subsided.

If the intussusciens is viable, the removal of the intussusceptum has been accomplished with considerable success through a linear incision in its wall. Reference to Table III shows nine such operations with seven recoveries and two deaths. The relatively low mortality may be partially accounted for by the fact that all nine cases were reported during the past ten years, and that with two exceptions the intussusception was either of the subacute or chronic variety.

The viability of the intussusciens also permits of intussusception being treated by enterostomy or by ileocolostomy. If the intussusceptum is necrotic, the slough is eventually discharged through the bowel. If, as is the case with many subacute or chronic intussusceptions, the intussusceptum is viable, an ileocolostomy relieves the obstruction, and by deflection of the fecal current exerts a beneficial effect upon any benign ulceration that may have been responsible for the intussusception. In such cases secondary resection should follow as soon as the patient's condition permits. Reference to Table III shows 13 operations of this character with five recoveries and six deaths. In the two remaining cases the result is not mentioned.

Of greater value than either of the preceding methods is the treatment of irreducible intussusception in adults by resection. This is the method of choice in all suitable cases in which attempted reduction, carried on for a few minutes, is unsuccessful. How often too energetic or too persistent at-

tempts at reduction result in tearing the intestine need not be stated, but it is quite evident that the results of resection are most satisfactory in the absence of any such additional source of contamination, and that any leakage subsequent to anastomosis is less likely to occur if the intestine is divided at a point where it is free from inflammatory changes. Such a resection must invariably be preceded by as much disinvagination as can easily and quickly be accomplished. Exceptionally, as in the first case reported by the writer, the intussusception is totally irreducible. Usually, however, reduction is possible to such an extent that subsequent resection is limited to a segment of intestine not exceeding 6 to 18 inches in length. After the removal of the affected segment, the risk of intestinal toxæmia should be diminished by evacuating the contents of the intestine above the point of suggested anastomosis. Frequently, however, if the operation is done sufficiently early, the upper intestine is empty and this step of the operation may be omitted. Reference to Table III shows 84 cases treated by resection, with 41 recoveries, 34 deaths, and 9 cases in which the result is not stated. It must be noted, however, that the majority of fatal cases were reported in the literature at a time when the technic of resection had not been perfected and when the operation itself was frequently delayed until peritonitis had developed.

The discussion of the treatment of intussusception in adults is not complete without referring to a series of 19 cases mentioned in Table III which were treated by the method of complete reduction followed by resection with 7 recoveries, 8 deaths, and 4 cases in which the result is not stated. This method seems to have been adopted chiefly in cases of intussusception associated with tumors. In this group of cases partial disinvagination is usually possible until the segment containing the tumor is reached. At this stage, the removal of the growth by enterotomy is sometimes possible, but in all malignant tumors as well as in those benign tumors in which the wall of the intestine is extensively involved, resection is imperative. Resection after reduction in other varieties of intussusception

than those associated with neoplasms is contraindicated, for it means, first, the unnecessary prolonging of the operative time and, second, in the event of a gangrenous intussusceptum, the exposure of the patient to unnecessary risk of peritoneal contamination.

Table III also mentions five cases in which the growth was removed through the rectum, with three recoveries and two cases in which the result is not stated. Although the small number of cases admits of no definite conclusion, the satisfactory results here reported would indicate the application of this method of treatment to all forms of benign neoplasm associated with intussusception in the lower part of the intestinal canal where the tumor presents in the rectum. In some cases of this group the removal of the growth must be followed by immediate laparotomy to establish the continuity of the colon, as well as to prevent leakage into the peritoneal cavity.

Finally, reference to Table III shows four cases of intussusception treated by enterostomy with three deaths and one recovery, and 12 cases in which an artificial anus was established, with one recovery, eight deaths, and three cases in which the result is not stated. Either measure is purely palliative, and it is scarcely necessary to call attention to the fact that the obstruction rather than the operation was the actual cause of the associated high mortality. That relief is frequently afforded by this method of treatment in all forms of both acute and chronic obstruction in which there is no impairment of circulation is well established. On the other hand, it is equally true that no benefit can be expected if gangrene is threatened or has actually taken place.

In the cases given below, a tabulation of the following factors was made: sex; age; prior history; onset, whether acute or chronic, together with its symptoms; the condition of the bowels; objective signs in rectum: blood, mucus, etc.; abdominal signs; tumor, distention, rigidity, etc.; the operation if any, the variety of intussusception, the result and any remarks on pathology, end results, etc.

## ABSTRACTS OF REPORTED CASES OF INTUSSUSCEPTION IN ADULTS.

## TABLE A.

*Due to Traction of Benign Tumors.*

Case 44 (Bryant, *Brit. Med. Jour.*, 1894, i, p. 353).—Female, age 84. Operation: Intussusception filling rectum with papilloma attached to orifice. Growth drawn down; ligated. Recovered.

Case 45 (*Ibid.*).—Female, age 50. Similar to Case 44.

Case 46 (Lockwood, *Path. Rep.*, London, 1892).—Female, age 30. Operation: Irreducible invagination; resection; suture end-to-end. Variety: Enteric, 5 inches long. Pathological remarks: Polyp pedunculated  $2\frac{1}{2}$  feet from cæcum.

Case 47 (Steiner, *Cent. f. Ch.*, 1896, p. 310).—Female, age 49. Prior history: Frequent attacks of obstruction. Onset: Complete obstruction. Operation: Enterotomy; removal of polyp size of plum. Position: Colon, descending. Recovered. Pathological remarks: Myxoma.

Case 48 (Greig Smith, *Lancet*, 1896, i, p. 31).—Female, age 31. Prior history: Complete obstruction two years ago with mass in right iliac fossa. Onset: Lately intermittent frequent pain, with constipation. Operation: Partial reduction; resection of remainder, after removal of tumor size of hen's egg; end-to-end with Murphy button. Variety: Iliac into colon. Recovered. Pathological remarks: Fibromyxoma.

Case 49 (Marchand, *Berl. klin. Woch.*, 1896, No. 6).—Male, age 23. Prior history of trauma: Fall on left side, next day dancing. Onset: Acute, pain and vomiting, symptoms of obstruction. Operation: Fifth day; enterostomy for supposed obstruction. Ileocolic into descending colon. Died. Pathological remarks: Subserous lipoma of cæcum.

Case 50 (Sprengel, *Archives Surg.*, Bd. 61, p. 1032).—Female, age 15. Prior history: Periodic attacks of pain with vomiting for eleven years. Onset: Painful period for month. Bowels: Stools always present. Thick transverse tumor above navel. Operation: Disinvagination; resection of 10 cm. large and 6 cm. small intestine; end-to-end with Murphy button. Variety: Ileocæcal. Recovered. Pathological remarks: Cyst of valvula Bauhini.

Case 51 (Brunner, C., *Beitrag*, xxv, p. 344).—Male, age 51. Onset: Six days pain. Bowels: No stool, no flatus. Rectal examination: Rectal tenesmus; tumor within sphincter. Operation: Sphincter dilated and divided posteriorly; tumor removed with invagination. Pathological remarks: Submucous lipoma.

Case 52 (*Ibid.*).—Male, age 4. Onset: Pain and vomiting three days. Bowels: One normal stool, then constipation. Rectal examination: Sharp hemorrhage. Operation: Resection with side implantation. Variety: Ileocæcal. Pathological remarks: Accessory pancreas in blind end of diverticulum had formed pedunculated tumor in lower ileum.

Case 53 (Hiller, *Beitrag*, xxiv, p. 509).—Male, age 51. Onset: Occasional pain and vomiting. Bowels: Little stool. Rectal examination: tenesmus; otherwise negative. Distention: Moderate. Operation: Reduction, tear in process; resection, end-to-end by suture. Iliac invagination. Died. Pathological remarks: Submucous lipoma.

Case 54 (Studsgaard, *Nord. Med. Arkiv.*, 1894).—Female, age 42. Operation: Irreducible; resection. Variety: Jejunal. Death in five days from peritonitis. Pathological remarks: Polyp, lipoma.

Case 55 (Castelain, *Gaz. Hebd.*, 1870, No. 20).—Male, age 43. Prior history: Habitual constipation. Onset: Loss of appetite, nausea. Bowels: Constipation. Rectal examination: Blood and mucus; tenesmus. (Case also made discharge of slough.) Fourth week, discharged large tumor, with thin pedicle. Recovered. Pathological remarks: Lipoma.

Case 56 (Vois, *Norsk. Mag. fur Lageviderl.*, 1881).—Operation: Invagination of lipoma into rectum; resection; reduction of intussusception by water injection.

Case 57 (Brohl-Tuffier, see Hiller).—Female, age 43. Prior history: Nine months constipation and pain. Tumor felt per rectum. Operation: Irreducible; artificial anus. Variety: Sigmoid. Died. Pathological remarks: Submucous pedunculated polyp in lower sigmoid.

Case 58 (Clos, *These*, Paris, 1883; see Hiller).—Female, age 45. Onset: Acute obstruction. Operation: Artificial anus. Died. Pathological remarks: Pedunculated lipoma in invaginated sigmoid.

Case 59 (Brohl, *Dissert. Würz.*, 1886).—Female, age 40. Prior history: Fifteen years abdominal pain. Onset: Past year sense of something coming down. Rectal examination: Descent of invaginated lipoma in rectum. Pathological remarks: Lipoma.

Case 60 (Treves, Leipzig, 1888).—Female, age 83. Prior history: One year indigestion, colicky pain. Bowels: Diarrhœa and constipation. Finally discharge of lipomatous polyp. Pathological remarks: Lipoma.

Case 61 (Link, *Wien. k. Woch.*, 1890, No. 13).—Male, age 45. Prior history: For five years attacks of obstruction. Tumor: Elastic, soft tumor size of man's fist in left hypochondrium for one year. Operation: Tumor evacuated with sudden gush of blood through rectum. Recovered. Pathological remarks: Tumor, pedunculated.

Case 62 (Michaux, *Bull. Soc. Chir.*, 1900, p. 734).—Female, age 23. Onset: Sudden pain and vomiting. No distention; tenderness. Operation: Fifth day; invaginated upper jejunum; irreducible; jejunum opened; resection of tumor and intestine. Died. Pathological remarks: Polyp "adenoma" was cause of irreducibility.

Case 63 (*Ibid.*).—Female, age 56. Onset: Five days obstruction. Bowels: No stools. Mass in left lower quadrant. Distention; visible coils. Operation: Irreducible; artificial anus after incision of tumor and discovery of polyp. Variety: Descending colon into sigmoid. Died. Pathological remarks: Resection of polyp.

Case 64 (Pitts, *Brit. Med. Jour.*, 1901, ii, 574).—Male, age 32. Onset: Acute, one day. Operation: Reduction; removal of growth; subsequent fecal fistula. Variety: Enteric. Died. Pathological remarks: Resection of gangrenous bowel; papilloma.

Case 65 (*Ibid.*).—Female, age 32. Prior history: Thirteen weeks' duration. No operation. Chronic ileocæcal. Pathological remarks: Fibroid growth in cæcum.

Case 66 (Maurice, *Lancet*, 1901, i, p. 248).—Female, age 23. Prior

history: Anæmic; vague abdominal pain, vomiting after eating. Onset: Sudden pain. Rigidity: General. Operation: Reduced; polyp removed; excision, circular suture. Variety: Jejunal. Died. Pathological remarks: Intussusception; segment 34 inches from pylorus gangrenous; 10 polypi between it and pylorus.

Case 67 (Jenly, *Wien. k. Woch.*, 1901, p. 1177).—Male, age 70. Onset: Four days' duration, pain. Bowels: Stool scant. Rectal examination: Hemorrhage, repeated. Prolapsing tumor, especially on coughing. Operation: Resection through anus. Variety: Colonic. Recovered. Pathological remarks: Polyp.

Case 68 (Marchand, *L'Inde. Med.*, 1901, p. 86).—Male, age 27. Prior history: Habitual constipation. Onset: Symptoms of appendicitis. Variety: Ileum into ascending colon; ileum into ileum. Pathological remarks: Polypi in ileum.

Case 69 (Bishop, *Med. Chron.*, 1900-01, p. 350).—Male, age 43. Prior history: Lifting, followed by protrusion seven months ago; occasional pain. Rectal examination: Constant mucus and blood; tenesmus; long tubular mass. Operation: Preliminary anastomosis followed by resection of intussusceptum, by Maunsell. Variety: Colonic. Recovered. Pathological remarks: Adenoma.

Case 70 (Ludloff, *Grenz. Gebiet.*, 1898, iii, p. 600).—Female, age 20. Prior history: Typhoid at 12; four years, occasional cramps. Onset: Chronic obstruction, especially loud splashing sounds. Bowels: Pain, followed by diarrhœal stools. Tumor: Size of fist over cæcum. Distention: Vomiting and pain. Operation: Irreducible; resection, end-to-end by suture. Variety: Ileocæcal. Recovered; four years after, well. Pathological remarks: Polyp size of bean in invagination; multiple polypi in cæcum.

Case 71 (Von Eiselsberg, *Arch. f. klin. Chir.*, Bd. 69).—Female, age 19. Prior history: Obstipation for years, especially last eight days; two days severe colic and vomiting. Rectal examination: Blood last twenty-four hours. Tumor: Below navel on right side, long tumor, disappearing later. Distention: Slight. Operation: Tear in attempted reduction; resection; end-to-end suture. Variety: Iliac. Died. Pathological remarks: Polyp.

Case 72 (*Ibid.*).—Male, age 54. Prior history: Six weeks, standing; onset with obstruction, relieved, with colic still persisting. Transverse movable tumor to right of navel. Operation: Reduction; resection of affected segment; end-to-end by suture. Variety: Ileocæcal. Recovered. Pathological remarks: Numerous polypi; one month later patient died from intercurrent disease.

Case 73 (Ray, *Lancet*, 1905, i, 567).—Female, age 30. Prior history: Pain for past six months, chiefly at and after defecation, in left iliac and lumbar; forty-eight hours, severe pain and vomiting. Rectal examination: Protrusion of tumor with enema. Operation: Reduction; removal of growth through enterotomy. Variety: Sigmoid. Recovered. Pathological remarks: Subserous lipoma.



Case 74 (Willard, *Tr. Chicago Path. Soc.*, 1907, 7, p. 174).—Male, age 30. Prior history: Two mild attacks of obstruction twelve and six months ago; one week ago, absolute constipation, increasing pain and tympanitis, vomiting; cathartic only. Bowels: Constipation. Rectal examination: Negative. Distention: Great; visible peristalsis. Operation: Resection; end-to-end suture. Variety: Jejunal. Recovered.

Case 75 (Chassignac, *Bull. de la Soc. Anatomique*, 1859, 2 s, iv, p. 205).—Male, age 39. Onset: Three months; sudden pain. Bowels: Constipation. Operation: Artificial anus. Variety: Ileocolic. Died. Pathological remarks: Polyp at apex.

Case 76 (Hulke, *Lancet*, 1879, vi, 810).—Female, age 16. Prior history: Similar attack two years ago. Onset: Sudden pain and vomiting. Abdominal tumor. Operation: Artificial anus. Variety: Ileocæcal. Died. Pathological remarks: Lipomatous polyp at apex.

Case 77 (Marchand, *Le Progres. Med.*, 1882, No. 11, p. 202).—Female, adult. Onset: Nine months recurrent. Bowels: Constipation becoming absolute. Rectal examination: Tumor 8 cm. from anus. Operation: Artificial anus. Variety: Sigmoidal. Died. Pathological remarks: Lipoma at apex.

Case 78 (Whipham, *Clin. Soc. Trans.*, 1891, xxiv, p. 95).—Female, age 29. Prior history: Many years umbilical pain, indigestion. Onset: Three weeks; pain. Bowels: Constipation. Rectal examination: Blood. Distention. Operation: Reduction of volvulus; jejunal intussusception. Died. Pathological remarks: Autopsy: Axial and jejunal looped volvulus; above this a thumb-sized polyp, about 5 ft. from pylorus.

Case 79 (Nothnagel, *Spezielle, Path. and Chir.*, 17, p. 316).—Male, age 50. Prior history: Fourteen months ago similar attacks lasting four months; one to three days' duration. Onset: Sudden pain and vomiting. Bowels: Increased peristalsis. Tumor: Epigastric. Rigidity: Right lower quadrant. Operation: Resection. Variety: Ileocæcal. Cured. Pathological remarks: Polyp at apex.

Case 80 (Fenger, *Hospitalsted*, 1904, No. 26).—Age 17. Prior history: Three years; diagnosis, peptic ulcer, gall-stones; exploratory operation, negative. Onset: Symptoms of obstruction. Tumor: Intermittent, appearing after previous operation. Operation: Resection. Variety: Enteric. Cured. Pathological remarks: Polyp at apex.

Case 81 (Rydygier, *Deut. Zeit. f. Chir.*, 1895, xlii, 113).—Male, age 32. Onset: Three weeks. Operation: Descending invagination because of walnut-sized fibromyoma; resection; artificial anus. Died. Pathological remarks: Perforative peritonitis.

Case 82 (*Ibid.*).—Male, age 22. Onset: Three years; acute, twenty days ago. Bowels: Constipation. Rectal examination: Bloody stools. Operation: Colic to anus; suture of perforation; artificial anus. Died. Pathological remarks: Polyp at apex.

Case 83 (Delore, *Rev. de Gyn. and Chir. Abdom.*, 1905, 9, 641).—Male, age 42. Onset: Sudden pain. Tumor. Operation: Reduction, resection. Variety: Ileocolic. Cured. Pathological remarks: Fibromyxoma at apex.

Case 84 (Hughes, *Lancet*, 1905, ii, 829).—Male, age 23. Prior history: Four years, typhoid; one year, four days of pain in right lower quadrant. Onset: Sudden, two days of pain and vomiting. Rectal examination: Blood. Tumor: In pelvis by rectal. Distention: Signs of peritonitis. Operation: Peritonitis. Variety: Ileal. Resection. Pathological remarks: Polyp at apex.

Case 85 (Andrews, *ANNALS OF SURGERY*, xliii, 473).—Male, young adult. Prior history of trauma: Jumped 5 ft. Onset: Immediately, sudden pain. Operation: Gangrenous ileocolic; resection. Died. Pathological remarks: Pedunculated fibropapilloma.

Case 86 (Royster, *N. Albany Med. Herald*, 1905, 24, 258-260).—Male, age 42. Prior history: Six months, occasional indigestion and vomiting. Onset: Four months, recurring attacks abdominal pain. Bowels: Constipation. Rectal examination: Mucus. Tumor: Sigmoid region. Distention. Operation: Reduction; excision of tumor. Variety: Ileal, looking as if tied in knot. Cured. Pathological remarks: Tumor pure fibroma.

Case 87 (Salzer, *ANNALS OF SURGERY*, 1907, xlv, 730-732).—Female, age 16. Onset: Sudden, four days of pain, vomited during examination. Tumor: Right of umbilicus, size of orange. Rigidity: Right rectus muscle. Operation: Ileocolic, reduced; excision of pedunculated tumor. Pathological remarks: Myoadenoma of ileum.

Case 88 (Lorenz, *Jahr. d. zw. Ch. klinik. Wies.*, 1906-07, 41-44).—Male, aged 58. Onset: Gradual; symptoms of chronic intestinal stenosis. Tumor: Sausage-shaped, transverse, alternately hard and soft; at left extremity hard, egg-shaped tumor. Operation: Ileocæcal invagination; tumor on ileocæcal valve; hard nodes in mesentery; resection of lower ileum, cæcum, ascending colon. Cured. Pathological remarks: Lipoma.

Case 89 (Shetton, *Brit. Med. Jour.*, 1908, i, 190).—Female, age 25. Onset: Acute pain and vomiting. Tumor: Indefinite; right inguinal region. Operation: Enteric, irreducible; resection. Pathological remarks: Sessile polyp at apex.

Case 90 (Leuret, *Bull. et N. Anat.*, 1907, v, 82, p. 652).—Female, age 45. Onset: Acute pain and vomiting. Bowels: No stool or gas passed for four days. Distention. Operation: Ileal,  $\frac{1}{2}$  metre above cæcum; reduction; excision of tumor. Died. Pathological remarks: Sessile myxofibroma.

Case 91 (Haeberlin, *Cor. Bl. f. Schw. Aerts.*, 1908, 38, 211, 248).—Female, age 66. Prior history: Two months, diarrhoea and emaciation. Onset: Ten days, pain and vomiting. Bowels: Partial occlusion. Distention. Operation: Enteric, with hard body at apex; attempt to reduce caused tear; resection. Cured. Pathological remarks: Fibroma; fecal fistula twelfth day.

Case 92 (*Ibid.*).—Female, age 58. Prior history: Gall-stones. Onset: Sudden pain and vomiting. Bowels: Constipation. Rectal examination: Blood. Tumor: Firm, kidney-shaped, movable. Distention: Right side.



Operation: Ileocæcal; irreducible; enterostomy. Died. Pathological remarks: Autopsy: Pedunculated hard fibroma in lumen of intestine.

Case 93 (Delore, *Rev. de Chir.*, 1908, vol. 38, 39-67).—Female, age 36. Prior history: Four months, pain in right lower quadrant with tumor; constipation. Onset: Three days, acute. Bowels: Absolute constipation. Rectal examination: Blood. Tumor: Right lower quadrant. Distention. Operation: Ileocæcal; irreducible; end-to-end suture. Died on seventh day. Pathological remarks: Pedunculated myoma at apex.

Case 94 (*Ibid.*).—Male, age 42. Onset: Five months, colic and vomiting. Bowels: Constipation. Rectal examination: Negative. Tumor: Negative. Distention: Negative. Operation: Ileocæcal; incision of colon, through opening resection intussusceptum and tumor at apex. Cured. Pathological remarks: Fibromyoma.

Case 95.—Male, age 39. Onset: Eleven weeks, recurrent pain. Bowels: Tenesmus. Rectal examination: Blood and mucus. Tumor: Left hypochondrium. Operation: Resection. Pathological remarks: Benign, variety not stated.

Case 96 (Haasler, *V. Langenbeck Arch.*, 1902, Bd. 68, p. 817).—Male, age 26. Prior history: Acute abdominal pain; recurred in nine days; continuous vomiting (fecaloid). Onset: Acute pain, hiccough. Bowels: Constipation. Rectal examination: Mucus. Tumor: Left lower quadrant, movable. Operation: Resection; rupture; necrotic bowel. Died. Pathological remarks: Polyp at base of intussusception.

Case 97 (*Ibid.*).—Male, age 35. Prior history: One year, rumbling in abdomen, with occasional sudden onset of constipation, meteorism and pain about umbilicus. Onset: Seven weeks, severe; more frequent pain and vomiting (fecal). Bowels: Diarrhœa. Rectal examination: Hard mass. Distention. Operation: Peritonitis, enteric; reduction; resection Meckel's diverticulum; artificial anus. Died. Pathological remarks: Autopsy showed Meckel's diverticulum 2.18 m. from ileocæcal valve, invaginated; at its base a plum-sized fibrous tumor.

Case 98 (*Ibid.*).—Male, age 25. Onset: One week, sudden pain and vomiting. Bowels: Diarrhœa. Rectal examination: Pus. Tumor: Left of umbilicus, moving to left. Operation: Colic; resection of mass size of three fists. Pathological remarks: Polyp (lipoma) at apex.

Case 99 (Herbun, *Arch. f. klin. Chir.*, 1902, vol. 68, xliii, p. 1009).—Female, age 52. Prior history: Eleven months, pain, bloody mucus, constipation. Onset: Eleven days, pain and vomiting. Bowels: Constipation absolute. Rectal examination: Rectal tumor. Operation: (1) Incision of rectum (posterior route), artificial anus; (2) resection of tumor. Cured. Pathological remarks: Variety not given.

Case 100 (Don, *Lancet*, 1909, i, 1107).—Female, age 44. Onset: Vomiting, chronic course. Rectal examination: Blood and mucus; prolapse of tumor with movement. Operation: Resection through anus, followed by reduction through laparotomy. Sigmoid. Recovered. Pathological remarks: Papilloma.

Case 101 (Riedel, *Deut. med. Woch.*, 1909, 35, 1654).—Male, age 15. Prior history: Periodic pain from seventh year; frequent vomiting; attacks in morning and of one hour's duration. Bowels: Normal. Tumor: In right abdomen, during cramps only. Operation: Partial reduction; resection of segment containing growth. Iliac. Recovered. Pathological remarks: Character not stated.

Case 102 (*Ibid.*).—Female, age 48. Onset: Acute; fecal vomiting in twelve hours. Rectal examination: Invagination felt. Tumor: size of two fists, in left abdomen. Distention marked. Operation: Artificial anus, followed by resection through rectum. Sigmoid. Recovered. Pathological remarks: Character not stated.

Case 102a (Mayo Bros., personal communication).—Adult. Onset: Several months, colic. Operation: Resection. Iliac. Recovered. Pathological remarks: Adenofibroma.

Case 102b (Mayo Bros., personal communication).—Age, 14. Operation: Resection. Iliac into cæcum and ascending colon. Recovered. Pathological remarks: Myoma.

Case 102c (McWilliams).—Female, age 45. Onset: Four weeks, attacks of abdominal pain at intervals. Bowels: Diarrhœa. Rectal examination. Blood and mucus; tenesmus; rectal mass and tumor in addition on the apex. Tumor: In left lower quadrant. Operation: Attempted reduction; incision of bowel; resection. Sigmoid. Recovered. Pathological remarks: Papilloma, possibly malignant but not invading muscularis.

#### TABLE B.

##### *Associated with Malignant Tumors.*

Case 103 (Decker, *Bull. de la Soc. med. de la Suisse Romande*, 1880, May, No. 5).—Female, age 58. Onset: Thirteen months, pain (two days ago) and vomiting (three days ago). Tumor: Right upper quadrant. Distention: Visible peristalsis. Operation: Ileocæcal. Died. Pathological remarks: Autopsy, malignant tumor of cæcum.

Case 104 (Czerny, *Arch. f. path. Anat. Virchow*, ci, 48, 1885).—Male, age 52. Onset: Two months, pain and vomiting. Bowels: Diarrhœa. Tumor: Right upper quadrant. Operation: Ileocæcal, reduction; resection of tumor. Cured. Pathological remarks: Malignant tumor at apex, sloughing muscle wall hypertrophied (microscopically).

Case 105 (Koenig, *Arch. f. klin. Chir.*, 1890, xl, 911).—Female, age 18. Prior history: One year ago, sarcoma of lower jaw. Onset: Sudden pain and vomiting. Bowels: Constipation. Tumor. Distention: Asymmetrical. Operation: Colic; ulcerating tumor at apex.

Case 106 (Koenig, *Ibid.*).—Prior history: Tuberculous. Onset: sudden pain. Rectal examination: Bloody stools; tumor palpated in rectum, level of internal sphincter. Operation: Rectal, sacral route; excision. Cured, three years. Pathological remarks: Carcinoma.

Case 107 (Rydygier, *Deut. Zeit. f. Chir.*, 1895-6, 42, 113).—Male, age 47. Onset: Nine months. Operation: Carcinoma at apex. Entero-anastomosis. Died.

Case 108.—Age 40. Onset: Six months. Tumor. Operation. Ileocæcal; resection. Cured. Pathological remarks: Adenocarcinoma.

Case 109 (Paetzold, *Deut. med. Woch.*, 1906, 32, 34).—Adult. Onset: Pain. Bowels: Diarrhœa. Tumor. Variety: Ileocæcal. Pathological remarks: Adenocarcinoma, ileocæcal valve.

Case 110 (*Ibid.*).—Adult. Onset: Pain. Bowels: Diarrhœa. Tumor. Variety: Ileocæcal. Pathological remarks: Alveolar sarcoma, ileocæcal valve.

Case 111 (Shetton, *Brit. Med. Jour.*, 1908, i, 190).—Male, age 50. Prior history: Six months, similar attack. Onset: Acute; absolute constipation. Mass in rectum. Reduced by rectal manipulation under ether. One week later rectal tenesmus. Blood and mucus. Ulcerated intussusception protruding from anus. Operation: Reduction and resection of colic variety. Pathological remarks: Malignant sessile polyp in sigmoid.

Case 112 (Haeberlin, *Corr. Bl. f. Schw. Aert.*, 1908, 38, 211-248).—Female, age 56. Prior history: Seventeen years ago, colicky pains; six months, loss of appetite and weight. Onset: Six months. Bowels: Diarrhœa. Tumor: Area of transverse colon. Visible peristalsis. Operation: Cæcal in ascending colon, reduced; resection of tumor. Pathological remarks: Gelatinous carcinoma.

Case 113 (Combs, *Wis. Med. Jour.*, 1907-8, vi, 251-255).—Male, age 68. Prior history: Four years, primary growth in left malar region. Onset: Latterly pain. Bowels: Constipation, alternating with fetid diarrhœa. Rectal examination: Sense of tumor high in rectum. Distention: Slight. Operation: Enteric; reduction; resection of tumor. Cured. Pathological remarks: "Melanotic epithelioma."

Case 114 (*Ibid.*).—Female, adult. Onset: Three months, no vomiting. Bowels: Finally absolute constipation. Rectal examination: Apex of invagination felt in rectum with irregular mass in its centre. Operation: Sigmoid, reducible; resection of tumor. Cured. Pathological remarks: Malignant with glandular enlargement.

Case 115 (Coffey, *ANNALS OF SURGERY*, 1907, xlv, 38-42).—Male, age 50. Onset: Thirteen days, "condition extreme." Rectal examination: Apex protruded through anus. Operation: Anastomosis. Died. Pathological remarks: Carcinoma of sigmoid.

Case 116 (Riess, *Am. Jour. Med. Sc.*, 1907, n. s. 134, 841-849).—Male, age 40. Prior history: Sarcoma of iris removed nine months ago; melanosarcomatosis present. Onset: Sudden pain and vomiting. Bowels: Stools small. Tumor. Variety: Iliac, 1 foot long; marked involvement by sarcoma.

Case 117 (Mayo, *ANNALS OF SURGERY*, 1896, 733).—Female, age 36. Prior history: Two years, movements difficult and with pain; six months, vomiting. Onset: For few days obstruction pronounced. Bowels: Constipated, occasional blood. Tumor: Size of egg, can be brought into pelvis under anæsthetic; continuing with soft tumor above. Rectal examination: Blood. Distention, tenderness. Operation: Reduced with some difficulty, especially apex; resection; end-to-end with Murphy button.

Iliac, upper, 15 inches in length. Recovered. Pathological remarks: Adenoma, with carcinomatous degeneration.

Case 118 (McBurney, *ANNALS OF SURGERY*, i, 1896, p. 441).—Female, age 40. Onset: Sharp pain, in almost daily attacks; no vomiting. Bowels: No constipation. Smooth tumor in left pelvis. Rectal examination: Normal. Distention frequent; tenderness. Operation: Reduction; excision; end-to-end with Murphy button. Enteric. Recovered. Pathological remarks: Myxosarcoma.

Case 119 (Meyer, *ANNALS OF SURGERY*, 1896, i, 443).—Female, age 46. Prior history: Symptoms of subacute appendix for ten days; sudden obstruction shortly after. Operation: Reduced; a second one at end of first also reduced; sessile tumor felt; resection; end-to-end with Murphy button. Iliac. Recovered. Pathological remarks: Fecal fistula for few days; sarcoma.

Case 120 (*Ibid.*).—Boy. Prior history: Chronic obstruction; loud gurgling. Visible peristalsis. Operation: Reduced; resection; end-to-end with Murphy button. Ascending and transverse colon. Recovered. Pathological remarks: Sarcoma, lower end of ascending colon; subsequent death.

Case 121 (Deichert, *Dissert. Gött.*, 1895).—Male, age 46. Prior history: No symptoms. Operation: Several enteric invaginations. Pathological remarks: Metastatic lymphosarcoma in stomach and intestine.

Case 122 (Marchand, *Berl. klin. Woch.*, 1896, No. 6).—Male, old. Prior history: Primary parotid sarcoma. Operation: Jejunal into cæcum. Pathological remarks: Melanosarcoma.

Case 123 (Brunner, C., *Beitrag*, v 25, p. 344).—Male, age 56. Prior history: Digestion disturbed for years; one year ago, bloody diarrhœa. Rectal examination: Tumor advances in straining. Operation: Sacral resection for invaginated carcinoma. Pathological remarks: In part colloid, in part cylindrical.

Case 124 (Fleiner, *Virchow, Arch.*, Bd. 101, p. 484).—Male, age 45. Prior history: Pain, irregular stool, and tumor for one year. Very movable tumor. Rectal examination: Fourteen days, blood. Operation: Partial reduction; resection; circular enterorrhaphy. Ileocæcal. Died. Pathological remarks: Carcinoma of cæcum and ascending colon.

Case 125 (Billroth, *Arch. Ch.*, 1888, Bd. 43).—Male, age 40. Prior history: Eight months, pain and vomiting. Tumor: Variable, hard tumor under umbilicus. Rectal examination: Blood, two months. Operation: Irreducible; torn in attempt; resection; circular suture. Cæcal. Recovered. Pathological remarks: Carcinoma.

Case 126 (Senn, *Jour. Am. Med. Ass.*, 1890, p. 845).—Female, age 53. Prior history: Vomiting for one year. Tumor: Very variable, size of orange, above and to right of navel. Operation: Disinvagination; resection; lateral implantation. Variety: Cæcum into transverse colon. Died. Pathological remarks: Carcinoma, valve of Bauhini.

Case 127 (Billroth, 1890).—Male, age 32. Prior history: Colic three months in navel region. Tumor: Sausage shaped, above and to right of navel. Operation: Partial reduction; resection of ileum and cæcum;

circular suture. Variety: Cæcum into transverse colon. Died. Pathological remarks: Carcinoma of cæcum.

Case 128 (König, *Arch. klin. Chir.*, 1890, Bd. 40).—Female, age 18. Prior history: Primary sarcoma of tonsil; violent colic since. Tumor: Size of fist, above and to left of navel. Rectal examination: Blood and mucus. Operation: Resection of intussusceptum through cut in intussusciens. Colon. Died. Pathological remarks: Sarcoma, valve of Bauhini.

Case 129 (Von Baracz, *Arch. klin. Chir.*, 1891).—Male, age 8. Prior history: Painful abdominal crises, thirteen weeks. Tumor: Oval, ventral, movable in upper left hypochondrium. Rectal examination: Blood in stools. Operation: Irreducible, ileocæcal into descending colon; enterostomy. Died. Pathological remarks: Sarcoma, valve of Bauhini.

Case 130 (MacCormac, *Lancet*, 1892, p. 310).—Male, age 36. Prior history: Painful abdominal crises for fifteen months. Tumor: Intermittent, cylindrical, immovable, in right iliac fossa. Operation: Reduced to end of colon; resection; artificial anus, subsequently closed. Ileocæcal. Recovered. Pathological remarks: Carcinoma of valve of Bauhini.

Case 131 (Barton, *ANNALS OF SURGERY*, 1893, p. 322).—Male, age 27. Prior history: Occasional obstruction for some weeks. Operation: Irreducible; resection; artificial anus. Ileocæcal. Recovered. Pathological remarks: Epithelioma of valve of Bauhini; death in operation for closure of artificial anus.

Case 132 (Körte, *Beitrag Bruns*, Bd. 40, p. 523).—Male, age 49. Prior history: Eighteen months, pain in right hypogastrium with constipation. Tumor: Transverse, sausage shaped, below navel, slightly movable. Operation: Resection without attempt at reduction; end-to-end with Murphy button. Ileocæcal. Recovered. Pathological remarks: Lymphadenoma of valve of Bauhini.

Case 133 (Lowenstein, *Ver. d. Deut. G. Ch.*, 1890, 94-97).—Male, age 56. Prior history: Occasional abdominal pain for three months with emaciation. Bowels: Persistent constipation; occasional diarrhœa. Tumor: In left upper segment, elastic, size of several fists. Rectal examination: Tenesmus. Operation: Resection; end-to-end with suture. Ileum into colon. Recovered. Pathological remarks: Carcinoma, cæcum.

Case 134 (Lejars, *Rev. de Gyn. e. Chir. abd.*, 1897, i, 1029).—Female, age 40. Prior history: Two years, emaciation; six months, colicky attacks of pain; finally obstruction and vomiting. Bowels: First glairy stools, then diarrhœa. Tumor: Firm, very movable to left navel. Visible peristalsis. Operation: Irreducible; resection after division; end-to-end with Murphy button. Ileocæcal to ascending colon. Recovered. Pathological remarks: Lymphadenoma of valve of Bauhini.

Case 135 (Wallenberg, *Berl. klin. Woch.*, 1864, p. 497).—Female, age 21. Prior history: Three days, constipation, followed by vomiting, cramps and diarrhœa. Distention for one week. Operation: Discharge of slough, one foot long, of small intestine without relief. Died. Pathological remarks: Five and one-half weeks after, autopsy showed sarcoma of cæcum.

Case 136 (Pitts, *Brit. Med. Jour.*, 1901, ii, 574).—Male, age 32. Prior

history: Ill four months. Operation: Resection; lateral implantation. Cæcal. Recovered. Pathological remarks: Malignant growth at starting point.

Case 137 (Ludloff, *Grenz. Gebiet.*, 1898, 3, 600).—Male, age 6. Prior history: Five weeks after short attack of pain, subsiding with splashing sound, lately including pain; emaciated. Bowels: Constipation; lately diarrhœa. Tumor: Size of fist, below right border of ribs. Visible peristalsis on rubbing abdomen. Operation: Resection; end-to-end circular suture. Ileocæcal to one-half transverse colon. Recovered. Pathological remarks: Tumor at neck; lymphosarcoma; glandular enlargement; well four and one-half years later.

Case 138 (Von Eiselsberg, *Archiv. klin. Chir.*, Bd. 69, p. 1).—Female, age 40. Prior history: Colic eleven weeks, eleven days constipation. Bowels: Tenesmus, three weeks. Rectal examination: Blood and mucus eleven days, tumor in rectum fourteen days. Some distention. Operation: Resection; end-to-end suture. Sigmoid. Pathological remarks: Carcinoma.

Case 139 (Krecke, *Munch. med. Woch.*, 1900, i, p. 42).—Female, age 63. Prior history: Dysentery sixteen years ago; one year, irregular stools, vomiting, pain in right side in attacks; tender tumor. Tumor: Egg tumor in left lower abdomen, intermittent in appearance. Vaginal and rectal examination negative. Visible peristalsis. Operation: Resection, after preliminary division of colon; end-to-end suture. Ileum into ascending colon. Recovered. Pathological remarks: Carcinoma of cæcum; well one year after operation.

Case 140 (Rowlands, *Med. Press and Circ.*, 1909, 88, p. 348).—Male, middle age. Prior history: Eighteen months, occasional pain and bleeding from anus; acute for past three days; vomiting. Bowels: No stool. Rectal examination: Invagination in rectum. Distention increasing. Operation: Removed through anus, followed by reduction and suture through laparotomy. Sigmoid. Recovered. Pathological remarks: Carcinoma.

Case 141 (Riedel, *Deut. med. Woch.*, 1909, 35, 1654).—Male, age 43. Onset: Acute, vomiting. Bowels: Dark, non-bloody stool with enema. No tumor. Distention marked. Operation: Small multiple tumors felt in intestinal wall. Iliac. Died. Pathological remarks: Invagination 10 inches above ileocæcal valve; multiple sarcoma in Peyer's patches with mesenteric glands involved.

Case 142 (Dujon, *Bull. et mem. Soc. Anat.*, 1909, 84, 515-533).—Male, age 54. Prior history: Chronic obstruction for two months. Operation: Resection; lateral anastomosis with Murphy button. Near cæcum. Died. Pathological remarks: Second invagination at duodenum, both due to annular cancer.

Case 143 (Kammerer, *ANNALS OF SURGERY*, Aug., 1898).—Female, age 50. Prior history: Occasional pain and vomiting. Bowels: Alternately constipation and diarrhœa. Tumor: In pelvis, left side, somewhat changeable. Rectal examination: Tip of rounded mass felt. Operation: Reduced, enterostomy; wide excision of growth. Enteric. Recovered. Pathological remarks: Sarcoma.



TABLE C.

*Acute Cases without Cause.*

Case 195 (Elliot, *Tr. Am. Surg. Ass.*, 1905, 23, 295).—Male, age 38. Onset: Two weeks, vomiting. Bowels: Diarrhœa. Tumor: Left lower quadrant, movable. Distention and rigidity. Operation: (1) Incised colon to relieve constriction; two attempts to close artificial anus. Cured.

Case 196 (Hall, *St. L. Clinic*, 1906, 19, 39-47).—Female, age 52. Prior history: Indigestion, occasional nausea and vomiting. Onset: Two hours, pain and vomiting. Tumor: Right lower quadrant. Operation: Ileocæcal; reduction. Cured.

Case 197 (Raley, *Den. M. Times*, 1905-6, 25, 447-451).—Female, age 35. Prior history: Ten years, neuralgia of stomach. Onset: Sudden pain. Tumor: Felt under anæsthesia. Operation: Ileal, reduced. Cured. Following operation, good health but for hyperchlorhydria. One year after first attack, same symptoms, with vomiting. Tumor: Not found. Distention: Extreme peristalsis. Operation: Ileal, higher up, reduced. Cured.

Case 198 (Third, *Queen's M. Quart.*, 1905-6, 10, 70-73).—Female, age 52. Prior history: Recurring attacks July, 1903, to Nov., 1905, with progressively worse symptoms. Onset: Last attack sudden, pain and vomiting. Bowels: Diarrhœa and constipation, irregular. Rectal examination: Large tumor; blood. Tumor: Left lower quadrant. Distention: marked peristalsis. Died. Pathological remarks: Autopsy: remainder of colon and all but 8 ft. of small bowel in descending colon, sigmoid, rectum and protruding.

Case 199 (Sherran, *Clin. J. Lond.*, 27, 184-187).—Female, 49. Prior history: Umbilical hernia. Onset: One day, sudden pain and vomiting. (Hernia swollen, easily reduced.) Rectal examination: Blood. Tumor: Hernia (umbilical). Operation: Free fluid; relief of strangulated hernia. Cured. Pathological remarks: Nine days after operation passed section of intestine  $3\frac{1}{2}$  inches long; eighteen months later, signs of obstruction; operation, mass of adhesions at transverse colon; ileocolostomy.

Case 200 (Ware, *Lancet*, 1906, ii, 1721).—Female, age 27. Onset: Sudden pain. Bowels: Constipation. Tumor: Ill-defined, right lower quadrant. No distention. Operation: Iliac, irreducible; resection; suture. Cured. Pathological remarks: Twenty-two months later, symptoms of acute obstruction; rigid abdomen; operation; gangrenous lump, composed of small intestine twisted on itself; resection with Murphy button; cured.

Case 201 (Thompson, *Brit. Med. Jour.*, 1907, i, 1867).—Male, age 52. Onset: Sudden, five days, vomiting. Bowels: Constipation. Operation: Lower iliac; reduced. Died same evening.

Case 202 (Combs, *Wis. Med. Jour.*, 1907-08, 6, 251-255).—Female, age 54. Onset: Acute, pain and vomiting relieved by enemas; recurred in two days with fecal vomiting. Tumor: Right pelvis. Operation: Iliac, 9 inches above ileocæcal valve; attempt at reduction, tear; resection. Cured.

Case 203 (Riess, *Am. Jour. Med. Sc.*, 1907, n. s. 134, 841).—Male, age 27. Onset: Acute, forty-eight hours, pain and vomiting. Operation: Ileocolic, irreducible; ileocolostomy. Died.

Case 204 (Codman, *Bost. Med. and Surg. Journ.*, 1908, 158, 439-446).—Male, age 43. Onset: Acute, five days, pain and vomiting. Rectal examination: Blood. Tenderness in right lower quadrant. Operation: Ileocæcal, irreducible; Mixer tube in ileum, neck of mass left in wound after ligation of mesocolon; ten days later, attempt at enterocolostomy; second attempt caused death.

Case 205 (*Ibid.*).—Male age 24. Onset: Sudden, vomiting three days. Bowels: Moved. Rectal examination: Tenderness in whole pelvis, especially in right. Tumor: Right lower quadrant. Distention: Tenderness in right lower quadrant. Operation: Colic; resection. Cured.

Case 206 (*Ibid.*).—Male, age 38. Onset: Two weeks, vomiting and pain. Bowels: Diarrhœa, seven to twenty stools a day. Oval tumor in left side, doughy, firm. Rigidity, considerable. Distention, moderate. Operation: Colic, intussusceptum removed through long slit in colon; Mixer tube in same opening. Cured.

Case 207 (Elgart, *Wien. klin. Woch.*, 1903, p. 923).—Female, age 31. Prior history: Ten days ago, bloody stool. Onset: Acute, pain and vomiting. Bowels: Stool at beginning. Tumor: Oblique in right hypochondrium. Rectal examination: Blood. Operation: Reduction to 5 cm. above ileocæcal valve; then resection with end-to-end by Murphy button. Ileocolic half way up ascending colon. Recovered. Pathological remarks: No tumor or ulcer.

Case 208 (Chirat, *La Prov. Med.*, 1896, p. 604).—Female, age 19. Prior history: Peritonitis five years ago. Onset: Acute, pain and vomiting for thirty-six hours. Bowels: No stool or gas. Rectal examination: Blood from second day on. Distention moderate. Death seven days after onset without operation. Pathological remarks: Enteric invagination, upper jejunum and ileum, easily reduced; no cause.

Case 209 (Knotz, *Prag. med. Woch.*, 1896, 779).—Female, age 29. Prior history: Round worms. Onset: Acute, paroxysms of pain and vomiting. Bowels: No flatus. Tumor: Sausage-shaped, left side, not movable. Rectal examination: Mucus and blood; apex felt per rectum. Distention, beginning in right side. Operation: Complete reduction by injection of water.

Case 210 (Brunner, C., *Beitrag*, 25, p. 344).—Male, age 20. Onset: Acute pain and vomiting. Tumor: Cylindrical, in right lower quadrant. Operation: Reduction only after incision of neck of invagination; resection; end-to-end with suture. Ileocæcal. Died. Pathological remarks: No special cause.

Case 211 (Michaux, *Bull. Soc. Chir.*, 1900, p. 734).—Male, age 29. Onset: Acute pain and vomiting. Tumor: Sense of tumefaction. Rectal examination: No blood or mucus. Distention moderate; rigidity. Operation: Reduced. Enteric. Recovered. Pathological remarks: No cause.

Case 212 (*Ibid.*).—Female, age 28. Onset: Acute pain and vomiting. Tumor: Mobile tumor in right lower quadrant, intermittent with pain.

Tenderness and rigidity in right lower quadrant. Operation: Thirteen days after onset, irreducible; resection; lateral implantation. Ileocæcal.

Case 213 (Pringle, *Brist. Med. Chir. Jour.*, Dec., 1899).—Female, age 50. Prior history: Sharp colicky pain, intermittent, six months' duration. Tumor: Firm mass below navel, during pain. Distention. Operation: Irreducible; resection; end-to-end into abdominal wall. Enteric. Died. Pathological remarks: Intussusception 3 feet from pylorus.

Case 214 (Helbring, *Cent. f. Ch.*, 1901, 672).—Female, age 39. Onset: Acute pain and vomiting. Tumor: Movable, felt per vaginam. No distention. Operation: Irreducible; resection; lateral implantation. Ileocolic. Recovered. Pathological remarks: No mention of cause.

Case 215 (Pitts, *Brit. Med. Jour.*, 1901, ii, 574).—Male, age 31. Onset: Acute, eight days' duration. Operation: Resection; enterostomy. Enteric. Died. Pathological remarks: Death from peritonitis.

Case 216 (Jenly, *Wien. klin. Woch.*, 1901, p. 1177).—Male, age 28. Onset: Acute, vomiting and hiccough. Bowels: No stool, no flatus. Abdomen retracted. Operation: Resection; lateral implantation Iliac, gangrenous. Recovered. Pathological remarks: No special cause.

Case 217 (*Ibid.*).—Female, age 27. Onset: Acute, six days pain and vomiting. Bowels: Daily stool. Tumor: Above and to left of navel, hard tumor, sausage shaped. Rectal examination: No blood, no mucus; rectum negative. Distention: Moderate. Operation: Ileocolostomy, followed by subsequent resection. Ileocolic to splenic flexure. Recovered. Pathological remarks: Edematous condition of ileocæcal valve.

Case 218 (Ludloff, *Grenz. Gebiet.*, 1898, iii, p. 600).—Male, age 22. Prior history: Three attacks in three weeks with acute cramps of short duration, and tumor. Bowels: Daily diarrhoeal stool. Tumor: Sausage-shape, above navel. Distention: Slight. Operation: Complete resection with end-to-end by suture. Ileocæcal to splenic flexure. Recovered. Pathological remarks: No cause.

Case 219 (Roberts, *Kentucky Med. Jour.*, 1909, viii, p. 1212).—Female, age 25. Prior history: Constipation and indigestion for months. Onset: Acute, colicky pain; no vomiting at first. Bowels: No stools. Oblong tumor below umbilicus. Rectal examination: Tenesmus. Rigidity: Slight. Operation: Gangrenous; resection with end-to-end suture. Iliac. Died. Pathological remarks: Death from peritonitis.

Case 220 (Poitan, *Pediatr.*, Lille, 1909, vii, 63-66).—Male, age 18. Onset: Acute, pain and vomiting, subsiding. Symptoms of peritonitis on sixteenth day. Bowels: No stool or flatus. Distention and rigidity: Slight, right side. Operation: Five feet above ileocæcal valve; resection; end-to-end by suture. Iliac. Recovered. Pathological remarks: No cause.

Case 221 (Sherran, *ANNALS OF SURGERY*, 1909, i, 875-878).—Male, age 30. Onset: Acute, pain and vomiting. Bowels: Two loose stools followed by complete constipation. Rectal examination: Blood? Distention: "Rectovesical pouch filled with fluid." Operation: Reduced with difficulty. Ileocolic. Recovered. Pathological remarks: No cause.

Case 222 (Gibbon, personal communication).—Male, age 19. Prior history: Previous good health. Onset: Sudden pain and vomiting.

Bowels: Constipation. Tumor: Right lower quadrant. Rectal examination: Negative. Rigidity. Operation: Split colon; resection of intussusceptum; lateral ileocolic anastomosis. Ileocolic. Recovered.

Case 222a (*Ibid.*).—Male, age 58. Onset: History indicating intestinal obstruction. Operation: Resection; ileostomy; colostomy. Ileocæcal. Died. Pathological remarks: Patient in bad condition; bowels gangrenous.

Case 223 (Kersten, *Deut. Zeit. f. Chir.*, 1849, Bd. 51, Hft. 56).—Male, age 30. Prior history: Two months ago, following lifting heavy weight, abdominal pain and constipation. Onset: Four days, pain. Tumor: Left side. Distention. Operation: Ileocolic, split intussusciens; resection of intussusceptum, including perforation. Recovered. Pathological remarks: Intussusceptum gangrenous; bloody purulent abdominal fluid; perforation.

Case 224 (Wilson, *Transylvania Jour. Med.*, 1835, viii, 486).—Male, age 18. Onset: Seventeen days. Bowels: Intestinal obstruction symptoms one hundred and eighty-one days. Cured. Pathological remarks: Gangrenous bowel.

Case 225 (Howse, *Med. Chi. Trans.*, 1876, lix, 85).—Male, age 33. Onset: Eighteen days. Operation: Mass taken outside abdomen and reduced, replaced. Cured.

Case 226 (Bellamy, *Brit. Med. Jour.*, 1879).—Female, age 34. Onset: Pain and vomiting (fecal). Rectal examination: Ileum and colon protruding. Abdominal tumor. Operation: Ileocæcal; bimanual reduction. Cured.

Case 227 (Kleberg, *Arch. f. klin. Chir.*, 1879, xxiv, 387).—Male, age 40. Prior history: Hernia one year before; intestinal obstruction; operation, cure. Onset: Few hours. Variety: Double, from above down and from below up, in a common intussusciens.

Case 228 (Mikulicz, Braun, *l. c.*, 690, No. 188).—Adult. Prior history: Constipation. Onset: Pain. Bowels: Constipation, followed by bloody stool. Tumor: Right lower quadrant, moved to epigastrium then to left lower quadrant. Operation: Colic into sigmoid.

Case 229 (Braun, *Verh. d. Deut. Gesell. f. Chir.*, 1885, 501).—Female, age 36. Prior history: Slight pain in right lower quadrant. Onset: Eight days, pain and vomiting. Distention. Operation: Ileocæcal; resection; suture of perforation. Died. Pathological remarks: Autopsy: General peritonitis, gangrenous bowel.

Case 230 (Kuster, *Verh. d. Deut. Gesell. f. Chir.*, 1879, i, 81).—Male, age 42. Onset: Six days, pain and vomiting (fecal). Rectal examination: Blood. Operation: Ileocæcal; resection. Died. Pathological remarks: Gangrenous bowel, peritonitis.

Case 231 (Wahl, Braun, *l. c.*).—Age, 44. Onset: Gradual for nine days, vomiting. Bowels: Constipation. Rectal examination: Prolapse from anus, size of child's head on ninth day. Rigidity: At localized spot, inferred to be tumor. Operation: Artificial anus; ileocæcal. Died. Pathological remarks: 29 cm. ileum, ascending colon, and transverse colon in descending colon; ileocæcal valve at anus.

Case 232 (Winniwarter, *Mitt. auf. d. XIV Cong. d. Deut. Gesell. f. Chir. Brieflich. Notiz.*).—Male, age 60. Onset: Sudden, while at stool, pain. Bowels: Constipation absolute. Tumor: Left lower quadrant. Operation: Artificial anus. Pathological remarks: Bloody serum in abdomen.

Case 233 (Carrier, *Gaz. med. de Lyon*, 1866, No. 4).—Male, age 23. Onset: Sudden. Tumor: Right lower quadrant. Operation: Artificial anus. Ileocæcal. Died.

Case 234 (Braun, *Verh. d. Deut. Gesell. f. Chir.*, 1885, 501).—Male, age 63. Onset: Sudden pain and vomiting (fecal). Tumor: Parallel to Poupart's left lower quadrant. Distention. Operation: Resection, ileo-cæcal. Died. Pathological remarks: Necrosis, peritonitis.

Case 235 (Pilgrim, *Indian Med. Gazette*, 29, 1894, 297).—Male, age 29. Onset: Sudden pain and vomiting. Rectal examination: Rectal prolapse. Operation. Cured.

Case 236 (Rydygier, *Deut. Zeit. f. Chir.*, 1895, 6, xlii, 113).—Male, age 31. Onset: Five days. Operation: Ileocæcal into rectum; attempt at reduction, rupture; resection; entero-anastomosis. Died.

Case 237 (*Ibid.*).—Male, age 20. Onset: Sixty hours. Operation: Ileal; resection. Cured.

Case 238 (*Ibid.*).—Female, age 43. Onset: Eight days. Operation: (1) Artificial anus; (2) resection; (3) closure of artificial anus; separate operations. Cured. Pathological remarks: One year later, 50 cm. piece of bowel passed.

Case 239 (*Ibid.*).—Male, age 26. Onset: Ten days. Operation: Cæcal; resection. Died. Pathological remarks: Gangrenous bowel.

Case 240 (*Ibid.*).—Male, age 43. Onset: Fourteen days. Operation: Reduced. Variety not stated. Died. Pathological remarks: Pseudodiphtheria.

Case 241 (*Ibid.*).—Male, age 60. Onset: Ten days. Operation: Ileo-cæcal; artificial anus.

Case 242 (*Ibid.*).—Male, age 68. Onset: Three days. Operation: Colic; reduction.

Case 243 (*Ibid.*).—Female, age 56. Onset: Eight days. Operation: Ileo-cæcal; resection; removal of mass per anum because of difficulty of bringing it up into abdomen. Died.

Case 244 (Bell, *Montr. Med. Jour.*, 1905, 34, 619).—Male, age 18. Onset: Sudden pain and vomiting. Bowels: Absolute constipation. Operation: Ileal; resection. Died.

## TABLE D.

*Acute Cases With Known Cause.*

Case 174 (Burekhardt, *Bericht ü. d. Chir. Abteil. d. Ludwig's Spitalis Charlottenhilfe im Jaarh*, 1884, p. 23).—Male, age 24. Prior history: Swallowed nail four months ago. Onset: Sudden pain. Operation: Ileo-cæcal; reduction. Cured.

Case 175 (Saltzman, *Leichenstern Prag. Monat.*, 1874).—Male, age

29. Prior history of trauma: Directly after lifting heavy weight. Onset: Sudden pain and vomiting (fecal). Tumor: Right lower quadrant, size of fetal head. Distention. Operation: Artificial anus, after attempt at reduction with resulting rupture. Died.

Case 176 (Alglave, *Bull. et mem. Anat.*, 82, 445-452).—Male, age 40. Onset: Acute, three days pain and vomiting. Bowels: Constipation and tenesmus. Rectal examination: Blood. Distention. Operation: Ileocaecal, irreducible; ileosigmoidostomy. Died. Pathological remarks: Autopsy, large ulcer at apex of invagination.

Case 177 (Reiss, *Am. Jour. Med. Sc.*, 1907, n. s. 134, 841-849).—Male, age 17. Prior history: Twenty-sixth day of typhoid. Onset: Acute (diagnosis, perforation). Operation: Jejunal, 3 inches below duodenum; reduced. Cured.

Case 178 (*Ibid.*).—Female, age 19. Prior history: Fortieth day of typhoid. Onset: Pain and vomiting. Bowels: Tenesmus. Rectal examination: Blood and mucus. Operation: Ileocolic, reduced. Cured.

Case 179 (*Ibid.*).—Male, age 36. Prior history of trauma: Struck just above crest of ileum by heavy beam; shock twenty-four hours, then pain and vomiting. Pelvic examination: 12 ounces bloody urine. Rigidity. Operation: Small intestine contracted in many places as if ligatured, at one point enteric invagination for 2 inches; reduction. Died. Pathological remarks: Shock.

Case 180 (Haasler, *V. Langenbeck Arch.*, Bd. 68, p. 817).—Female, age 26. Onset: Seven days, pain and vomiting. Bowels: Constipation absolute at first; bowels moved later. Distention. Variety: Ileal. Pathological remarks: Tuberculosis of intestine.

Case 181 (Ash, *Brit. Med. Jour.*, 1902, May 3).—Male, age 25. Prior history: Twenty-fifth day, normal temperature following typhoid; relapse fortieth to fifty-seventh day. Onset: Ninth day of relapse; sudden pain and vomiting; collapse. Rigidity: Right lower quadrant. Operation: Ileocolic; reduction. Cured.

Case 182 (Ross, *ANNALS OF SURGERY*, 1904, xxxix, p. 604).—Male age 17. Prior history: Typhoid; on twenty-first and twenty-fifth days, hemorrhages. Onset: Twenty-sixth day, sudden pain. Operation: 3 feet from duodenojejunal juncture 3 inches of intussusception; reduction. Cured. Pathological remarks: Diagnosis, perforation.

Case 183 (Watkins-Pitchford, *Brit. Med. Jour.*, Sept. 6, 1902).—Male, age 29. Prior history: Convalescent from typhoid. Onset: Sudden pain and vomiting (blood); collapse. Rectal examination: Black stools. Signs of peritoneal irritation. Intussusceptions in small intestine. Pathological remarks: Mucosa injected.

Case 184 (Fuschius, *Hufeland Jour.*, Bd. lx, 42).—Male, age 28. Prior history of trauma: While on a walking trip suddenly bent and recovered. Onset: Immediate, of pain, vomiting becoming fecaloid; eighteen days, acute symptoms with eructations. Tumor: Upper umbilical region. Distention: Appeared late. Operation: Laparotomy, ileocolic or colic; incised colon; reduction bimanually (in and outside colon); suture of opening; sutured ends carried out of abdomen and removed thirteen days



after operation. Cured. Pathological remarks: Stool four days after operation; complete recovery in thirteen days.

Case 185 (Pridmore, *Cent. f. Med.*, xviii, p. 890).—Male, age 40. Prior history: Dysentery. Onset: Peritonitis, fever. Bowels: Pus in stools. Rectal examination: Blood. Tumor: Soft, under right hypochondrium. Died. Pathological remarks: Gangrenous ileo-cæcal invagination; dysenteric ulcer in large intestine.

Case 186 (Stretton, *Lancet*, 1894, ii, 797).—Male, age 20. Prior history of heavy lifting. Onset: Acute pain and vomiting. Bowels: Natural movement; flatus at intervals. Rigidity; no distention; tenderness. Operation: Forty-eighth hour; invagination of lower ileum; reduced with difficulty. Recovered.

Case 187 (Michaux, *Kor. Bl. Schw. Aert.*, 1896, No. 26, p. 148).—Male, age 8. Prior history: Fell 12 feet, and walked home bent over. Onset: Twenty-four hours after, signs of peritonitis. (At end of week, prolapse of intestine, with signs of obstruction; death on eighteenth day.) Operation: Showed retroperitoneal hæmatoma. Died. Pathological remarks: Autopsy showed enteric invagination with ascarides above.

Case 188 (Steiner, *Cent. f. Chir.*, 1896, 310).—Female, age 21. Onset: Acute, six days' duration. Rigidity and tenderness in iliac region. Operation: Enteric, lower ileum, gangrenous; resection; end-to-end suture with Murphy button. Recovered. Pathological remarks: Date stone found in specimen.

Case 189 (Batul, *Prov. Med.*, 1901, p. 317).—Male adult. Prior history of trauma: Strenuous ride. Onset: Acute, pain and vomiting. Bowels: No gas or stools for two days. Rigidity and tenderness over spleen; no visible peristalsis. Operation: Tubercular ileum. Died. Pathological remarks: Multiple ulcers in end of jejunum; tuberculous ulcer at apex of invagination; small cavity in lung.

Case 190 (Ludloff, *Grenz. Gebiet.*, 1898, iii, p. 600).—Female, age 47. Prior history: First attack sixteen years ago. Onset: Pain ten weeks ago, becoming more frequent and ending in acute attack three days ago; vomiting. Rectal examination: Once blood; nothing per rectum. Tumor: Sausage-shaped, intermittent, with pain. Visible peristalsis; distention general; tenderness. Operation: Ileocæcal into lower sigmoid, ulcer at apex; ileum and sigmoid anastomosis. Died. Pathological remarks: Secondary obstruction on eighteenth day from extension of invagination; perforation; peritonitis.

Case 191 (Von Eiselsberg, *Archives*, 69).—Female, age 48. Prior history: Two weeks colic, more frequent of late. Onset: Past two days fecal vomiting. Bowels: Constipation. Distention very great; visible peristalsis. Operation: Ileocæcal into middle descending colon; reduction; resection of circular stricture of ileum; end-to-end by suture. Death from cardiac complication after wound was nearly healed.

Case 192 (Vignard, *Lyon. Med.*, 1905, i, 215).—Female, age 23. Prior history: Abdominal trauma fifteen days ago. Onset: One attack six weeks ago with tumor subsiding; no vomiting; after ten days, recurrence.

Bowels: Serous, not bloody diarrhœa. Tumor: Irregular, sausage-shaped, in right upper quadrant; tumor on left with recurrence. Operation: Partially reduced ileocæcal; lateral implantation after resection. Died. Pathological remarks: No leakage had occurred.

Case 193 (Ainsley, *Brit. Med. Jour.*, 1897, ii, p. 82).—Male, age 15. While playing football, sudden pain and vomiting on kicking the ball. Bowels: Constipation; always acted to enema. Rectal examination. Mucus and blood after three days. No tumor. Operation: Gangrenous; resection by Maunsell's method. Cured. Enteric, 3 inches long. Remarks: In perfect health fifteen months after.

Case 194 (Clubbe, *Brit. Med. Jour.*, 1897, ii).—Male, age 10. Prior history of trauma: After pulling cart. Onset: Pain and vomiting, three days' duration. Bowels: Constipation after action. Tumor: Elongated, below navel. Operation: Reduction easy. Cæcum into descending colon. Recovered.

#### TABLE E.

##### *Chronic Cases without Cause.*

Case 264 (Braun, Hanff, *Verh. der Deut. Gesellsch. f. Chir.*, 1885, 501).—Adult. Onset: Seven months, recurrent colic. Rectal examination: Mass in anus; foul mucoid discharges. Operation: Artificial anus. Died. Remarks: Type not given.

Case 265 (Besnier, *Etud. s. l. diagn. et s. l. Trait. de l'Intestin dans la cavité de l'abdomen*, Paris, 1857, p. 62).—Age 23. Onset: Two months, sudden pain; three days, vomiting (fecal). Bowels: Constipation followed by bloody stools. Rectal examination: Blood. Variety: Ascending, sigmoid into colon. Died.

Case 266 (Vergely).—Female, age 19. Prior history: Digestive disturbances one year. Onset: One year pain, vomiting two weeks. Bowels: One year constipation. Rectal examination: Blood; fetid mucus. Operation: Sigmoidorectal, reducible. Pathological remarks: Gangrenous perforation.

Case 267 (Riedel, *Mitt. a. d. Grenz. Geb.*, xiv, 1, 2).—Female, age 50. Onset: Beginning ten days after last child; fourteen years, recurrent attacks; acute onset; pain and vomiting sudden, three days' duration. Bowels: Diarrhœa, constipation absolute. Rectal examination: Blood. Tumor: Epigastric, varying in size. Distention. Operation: Ileo-ileocæcal; resection. Died. Pathological remarks: Venous thrombosis; pneumonia.

Case 268 (Rydygier, *Deut. Zeit. f. Chir.*, 1895-6, xlii, 113).—Female, age 47. Onset: Eight weeks. Operation: Resection; ileocæcal. Cured.

Case 269 (*Ibid.*).—Female, age 25. Onset: Five weeks. Operation: Resection; ileocæcal. Cured.

Case 270 (*Ibid.*).—Male, age 33. Onset: Four weeks. Operation: Ileocæcal; entero-anastomosis. Cured.

Case 271 (*Ibid.*).—Female, age 22. Onset: Six months. Operation: Ileocæcal; reduction. Cured. Pathological remarks: 20 cm. long.

Case 272 (*Ibid.*).—Female, age 38. Attacks: Twenty-one days ago,

eight days ago. Operation: Colic; artificial anus. Died. Pathological remarks: Peritonitis at operation.

Case 273 (*Ibid.*).—Male, age 26. Onset: Thirty-five days. Operation: Ileocæcal; reduction. Died. Pathological remarks: Suspicious spot in bowel at operation.

Case 274 (*Ibid.*).—Male, age 30. Onset: Six weeks. Operation: Ileocæcal; reduction; anchorage of bowel to abdominal wall. Cured.

Case 275 (Delore, *Rev. de Gyn. et Chir. Abd.*, 1905, 9, 641-658).—Male, age 20. Onset: Two to three years, pain and vomiting. Bowels: Diarrhœa. Rectal examination: Blood. Tumor: Left lower quadrant. Operation: Cut intussusciens; resection of intussusceptum from inside; ileocæcal. Cured.

Case 276 (Kronbach, *Deut. med. Woch.*, 1905, i, 1782).—Age 41. Onset: Seven weeks, sudden onset of pain and vomiting. Rectal examination: Blood. Operation: Ileocæcal; reduction; resection.

Case 277 (Hartmann, *Bull. M. Soc. Chir.*, 1908, 34, 563-566).—Male, age 18. Onset: Four months, pain. Bowels: Gurgling. Rectal examination: Blood, gross and microscopically. Tumor: Mobile, felt bimanually. Rigidity: Right upper quadrant. Operation: Ileal; resection.

Case 278 (Batchelor, *N. Orl. M. & S. J.*, i, 1905, 58, 570).—Male, age 54. Onset: Sixty days, pain and vomiting. Tumor: Fluctuating mass above umbilicus. Operation: Abandoned; ileocæcal. Died. Pathological remarks: Gangrenous bowel.

Case 279 (Miller, *Am. Jour. Obst.*, N. Y., 1906, 54, 869).—Female, age 26. Prior history: Four years, attacks. Onset: Pain and vomiting. Bowels: Diarrhœa. Tumor: Size small kidney, right lower quadrant, firm, tender, freely movable. Operation: Ileocolic to splenic flexure; irreducible; ileocolostomy.

Case 280 (Jahonlay, *Lyon Med.*, 1907, 108, 1714).—Male, age 52. Onset: Two to three months, pain. Bowels: Constipation. Tumor: Hard, slightly movable, right lower quadrant. Operation: Ileocæcal, with supposed cancer; lateral anastomosis; excision. Died. Pathological remarks: Pneumonia; autopsy showed no tumor.

Case 281 (Poisson, *Gaz. med. d. Nantes*, 1908, ii, 26, 336-338).—Female, age 13. Prior history: Forty days ago occasional vomiting with bloody stools; tumor felt below and to left of umbilicus. Onset: Present attack, continuous vomiting. Rectal examination: Forty-five days ago passed slough of small intestine. Distention and visible peristalsis in present attack. Operation: Jejunal, 1 m. below pylorus; below this intestine contracted; intestine at site of former invagination makes angle.

Case 283 (Haasler, V. Langenbeck's *Arch.*, 1902, Bd. 68, 817).—Female, age 32. Onset: Three months, pain becoming severe. Bowels: Eight weeks constipation followed by diarrhœa, some flatus. Rectal examination: Protrusion from anus easily removed by knife. Tumor: Fourteen days. Distention: Asymetrical. Variety: Ileocæcal; cæcum and appendix at anus. Died.

Case 284 (Hofmeister, *Zentbl. f. Chir.*, No. 48).—Male, age 32.

Onset: Ten weeks, typical invagination symptoms. Rectal examination: 25 cm. mass protruded from anus. Operation: Resection 140 cm. Cured.

Case 285 (Majewski).—Female, age 56. Prior history: Several years hard, tender swelling in cæcal region; six months ago sudden pain, vomiting, and diarrhœa; subsidence of acute symptoms with increase in size of tumor. Operation: Reduction. Ileum into cæcum and ascending colon. Recovered.

Case 286 (Elgart, *Wien. klin. Woch.*, 1903, p. 923).—Female, age 33. Prior history: Four months tumor in abdomen, gradual increase in size; pain in abdomen and back. Bowels: Normal. Tumor: Sausage-shaped tumor in left flank, smooth, movable. Operation: Reduced with difficulty; cæcum anchored. Ileocæcal. Recovered. Pathological remarks: No ulcer or tumor.

Case 287 (Stead, *Brit. Med. Jour.*, 1901, ii, 1458).—Female, age 72. Prior history: Chronic constipation with several attacks of colic and flatulence. Rectal examination: Protrusion of "tumor" from anus. Operation: Sphincter divided; reduction. Colon. Recovered. Pathological remarks: No mention of tumor.

Case 288 (Von Eiselsberg, *Archive*, Bd. 69).—Male, age 31. History: Eighteen days colic, followed by diarrhœa; vomiting after eating. Rectal examination: Blood for two days. Tumor: Long, hard, movable tumor in right side. Distention: Moderate. Operation: Irreducible; ileocæcal to hepatic flexure; end-to-end by suture. Recovered. Remarks: Three years after, occasional pain, stools normal.

Case 289 (*Ibid.*).—Male, age 35. Prior history: Three years, two years and six weeks ago, severe colic disappearing with enema. Bowels: Stools and gas, scant. Tumor: Sausage-shaped transverse, in upper abdomen. Operation: Reduction; resection to prevent recurrence. Ileocolic. Recovered. Pathological remarks: Three years later in excellent health.

Case 290 (*Ibid.*).—Male, age 36. Prior history: Three months, short colicky attacks; two and a half weeks ago, noticed distended loop. Bowels: Movement to enema for two and a half weeks. Distention: Two and a half weeks. Operation: Reduction; resection with end-to-end anastomosis by suture. Enteric. Recovered. Pathological remarks: Swelling, probably inflammatory, above a stricture of unknown character.

Case 291 (Baracz, *Cent. f. Chir.*, 1894, p. 622).—Male, age 19. Prior history: Three attacks of pain and vomiting, with constipation in past twenty-nine months; diarrhœa after last attack. Hard tumor in cæcal region for past year. Operation: Ileocolostomy with resection and end-to-end circular suture. Ileocæcal, irreducible. Recovered. Pathological remarks: Swelling only inflammatory.

Case 292 (Passagi, *Il Policlinico*, 1905, p. 10).—Male, age 30. Prior history: Intermittent colic, with variable tumor, vomiting over a period of nine months. Bowels: Constipation. Rectal examination: Mucus but no blood. Tumor: Right upper quadrant. Operation: Reduction; endoplication of cæcum by two parallel rows on either side anterior longitudinal band. Ileocæcal. Recovered.

CASE 293 (Battle, *Med. Presse*, 1897).—Male, age 50. Prior history: Constipation, vomiting for fourteen days. Rectal examination: Blood. Tumor: sausage-shaped, in left lower quadrant. Operation: Irreducible; cæcum anastomosed to colon. Colonic.

CASE 294 (Schiller, *Beitrag*, v, 17, p. 635).—Female, age 49. Prior history: For fifteen weeks daily attacks of pain, with no stool or gas lasting fifteen minutes, followed by normal stool. Tumor: Sausage-shaped, elastic, slightly movable. Visible peristalsis. Operation: Reduced. Ileum into colon. Recovered.

## TABLE F.

*Chronic Cases With Known Cause.*

CASE 245 (Müller, *Arch. f. klin. Chir.*, 1879, xxiv, 183).—Male, age 33. Prior history: Dysentery four months. Onset: Three months, pain and vomiting. Bowels: Irregular, with constipation, becoming absolute. Rectal examination: Blood and mucus. Tumor: Left lower quadrant. Variety: Ileocæcal to rectum. Died.

CASE 246 (Durante, *Bull. de la Soc. Anat.*, 1879).—Male, age 29. Prior history of trauma: Crushed between two wagons. Onset: Sudden, immediate; vomiting. Bowels: Diarrhœa. Rectal examination: Blood. Tumor: Left lower quadrant. Variety: Ileocæcal.

CASE 247 (Rydygier, *Deutsche Zeitschrift f. Chir.*, 1895, xlii, 113).—Female, age 18. Prior history: Ten years ago appendicitis. Onset: Chronic. Operation: Ileocæcal; enterocolic anastomosis. Pathological remarks: Inflammatory stricture of cæcum.

CASE 247a (*Ibid.*).—Male, age 23. Onset: Two months. Operation: Ileocæcal, resection. Died. Pathological remarks: General tuberculosis; invagination began at tuberculous ulcerated stricture.

CASE 248 (Haasler, V. Langenbeck *Arch.*, 1902 Bd. 68, 817).—Female, age 42. Prior history of trauma: Six weeks ago fell from electric car; concussion of brain. Onset: Few days later vomiting (constant), and pain in right lower quadrant. Bowels: Constipation. Tumor: Three weeks; right lower quadrant. Distention. Variety: Ileocolic.

CASE 249 (V. Braman, *Münch. M. Woch.*, 1900, p. 1712).—Male, age 25. Prior history: Family and personal history, tubercular. Onset: First attack ten months ago; colicky pain; attacks more frequent last 3 months; vomiting. Bowels: Diarrhœa. Distention slight; visible peristalsis; tenderness excessive. Operation: Irreducible; coils firmly bound together; resection; enteric. Recovered. Pathological remarks: Probably tubercular.

CASE 250 (Cavaillon, *La Prov. Med.*, 1901, No. 24).—Male, age 46. Prior history with onset: Three weeks; occasional severe pain after eating. Bowels: Alternating diarrhœa and constipation. Rectal examination: No blood. Tumor: In cæcal region, extending into epigastrium. No rigidity; visible peristalsis. Operation: Reduction; ileocæcal to splenic flexure. Pathological remarks: Serosa of cæcum studded with miliary tubercles.

CASE 251 (Quadflieg, *Münch. med. Woch.*, 1901, p. 1093).—Male, age 28. Prior history with onset: Occasional cramps followed by intermittent attacks of acute obstruction for two and a half months, with pain and vomiting. Bowels: stools normal; occasional constipation. Rectal examination: No blood or mucus. Tumor: Size of fist; changeable position, according to pain. Operation: Partial reduction; resection with lateral implantation; ileocæcal to transverse colon. Recovery. Pathological remarks: Broad, deep, circular ulcer in cæcum; cause unknown.

CASE 252.—Male, age 36. Prior history with onset: Typhoid fever one year ago; one attack mild, followed by free interval of six months; latterly constant attacks with vomiting. Bowels: Alternating constipation and diarrhoea. Rectal examination: Mucus; rectum negative. Tumor: Movable, size of fist, to right of navel; disappears with cessation of pain. Abdomen: Distention; tenderness. Operation: Complete resection; ileum to colon by suture. Variety: Ileocæcal to middle of transverse colon. Recovery. Pathological remarks: Ulcer on invagination.

CASE 253 (Maxwell, *St. Barth. Hosp. Rep.*, 1908-1909, 44, 153, 160).—Male, age 28. Prior history: Dysentery for two months. Rectal examination: Mucus and blood. Tumor absent. Retracted abdomen; tenderness over ascending colon. Operation: Irreducible in ascending colon; resection, end-to-end by suture; ileocæcal. Died promptly.

CASE 254 (*Ibid.*).—Male, age 56. Prior history: Dysentery for one month. Rectal examination: Mucus and blood. Tumor absent. Operation: Partially reducible; lateral anastomosis by Murphy button; ileocæcal. Death. Pathological remarks: Seventy-two hours; no tendency to repair.

CASE 255 (*Ibid.*).—Male, age 19. Prior history with onset: Trauma, followed in five days by dysentery. Attack, one month duration; pain severe over tumor. Tumor: Sausage-shaped over curve of colon. Operation: Reduced to size of small orange; then lateral anastomosis by suture. Recovery.

CASE 256 (*Ibid.*).—Male, age 29. Prior history with onset: Four months ago, lump in right upper quadrant, followed by severe pain; no vomiting. Rectal examination: Blood three months ago on two occasions. Tumor: Sausage-shaped over hepatic flexure, could be seen crossing abdomen from right to left with paroxysms of pain. Operation: Irreducible; covered over surface with miliary tubercles; lateral anastomosis; ileocæcal. Recovery. Pathological remarks: Tubercular.

CASE 257 (*Ibid.*).—Male, age 14. Prior history with onset: One month stools small with little blood; eleven days ago pain on right side; vomiting. Bowels: Constipation. Tumor: Indefinite lump over hepatic flexure. Operation: Reduced; lateral anastomosis with suture; ileocæcal. Recovery. Pathological remarks: Miliary tubercles on outside.

CASE 258 (*Ibid.*).—Female, age 13. Prior history with onset: Dysentery for two months; very emaciated. Tumor: Sausage-shaped over transverse colon, with paroxysmal pain. Operation: Reduced with great difficulty, revealing lump in cæcum; excision with lateral implantation;



ileocæcal. Died in four days from peritonitis. Pathological remarks: lump probably tubercular.

CASE 259 (Brin, *Bull. et Mem. Soc. de Chir.*, 1908, 34, 1257-1279).—Male, age 34. Prior history with onset: Three attacks in seven weeks of obstruction with pain and vomiting. Bowels: Bloody diarrhœa. Tumor: In right upper quadrant, disappearing with subsidence of pain. Operation: Reduced; ileocæcal to transverse colon. Recovery. Pathological remarks: Cæcal tuberculosis.

CASE 260 (Schiller, *Beitrag*, xvii, p. 635).—Female, age 35. Prior history with onset: Short, severe attacks of vomiting and colic for nine weeks; between attacks normal. Bowels: Diarrhœa; frequent tenesmus. Rectal examination: Blood and mucus. Sausage-shaped tumor over transverse colon. Operation: Irreducible; resection, with ileocolostomy; ileocæcal. Recovery. Pathological remarks: Ulcer in cæcum.

CASE 261 (Pridmore, *Brit. Med. Jour.*, 1897).—Male, age 40. Prior history with onset: Supposed malaria, then dysentery with abdominal pains. Bowels: Watery and blood-stained stools. Rectal examination: Offensive stools, with blood and pus before death. Sausage-shaped tumor shifting in position; tender. Variety: Ileocæcal. Death. Pathological remarks: Intestine in places gangrenous with old dysenteric ulcers.

CASE 262 (Boyce-Barrow, *Lancet*, 1897, i, 1411).—Male, age 11. Prior history with onset: Attacks of abdominal pain for two months; often vomiting solid food. Bowels: No diarrhœa. Rectal examination: blood and mucus past week. Tumor: Size of hen's egg in right upper quadrant; movable; changeable with pain. Operation: Irreducible; resection, end-to-end with Murphy button; ileocæcal. Recovery. Pathological remarks: Tubercular ulcer at apex of intussusception.

CASE 263 (Orton, *Brit. Med. Jour.*, 1898, i, 489).—Male, age 58. Prior history with onset: For six months pain with offensive stools. Tumor: Soft, doughy mass in right lower quadrant, thought to be feces; diminished by enema. Variety: Jejunum into rectum. Death from exhaustion three and a half years after onset. Pathological remarks: Intussusception irreducible; cæcal segment occupied by ulcerating mass, size of small egg, thought to be inflammatory.

#### TABLE G.

##### *Meckel's Diverticulum.*

CASE 144 (Struthers, *Lancet*, 1906, ii, 1345).—Female, age 5. Onset: Two months abdominal pain; two days repeated vomiting. Rectal examination: Prolapse two months, having at apex (reappearing two days ago) a polypoid mass (appendix, one and a half inches long, inverted). Tumor: Left lower quadrant. Distention. Operation: Ileocæcal reduced; appendix removed through incision in cæcum.

CASE 145 (Bridwell, *Lancet*, 1907, ii, 682-684).—Male, age three and a half. Prior history: Four months before, acute onset with hemorrhage from bowel without known cause. Onset: Five weeks pain and vomiting at intervals. Bowels: Complete constipation. Hard tumor in right

lumbar region and hypochondrium. R'gidity. Operation: Ileocolic from six inches above ileocæcal valve to middle of colon; reduced. Recurrence of pain after one week and two months later. Tumor in umbilical region. At operation an enteric invagination with Meckel's diverticulum at apex. Resection.

CASE 146 (Van Mandach, *Corr. Bl. f. Schw. Aertz*, 1907, 37, 729-732).—Male, age two and a half. Onset: Sudden vomiting. Bowels: Diarrhœa. Tumor in umbilical region. Distention. Operation: Ileocolic reduced; inverted diverticulum reduced itself spontaneously. With reduction several purse string sutures about Meckel's diverticulum to occlude lumen. Cured.

CASE 147 (Kothe, *Deut. m. Woch.*, 1908, 34, 2409).—Male, age 23. Prior history: Six months ago abdominal pain. Onset: Three days acute obstruction; pain and vomiting. Operation: Ileocæcal; partial reduction; resection; end-to-end by Murphy button. Pathological remarks: Meckel's diverticulum inverted at apex.

CASE 148 (Binnie, *Anat. Med. Gaz.*, 1908, 27, 356-358).—Female, age two. Onset: Colic one week, followed by acute obstruction. Tumor: Sausage-shaped; disappeared under anæsthesia. Operation: Transverse colon; resection. Cured. Pathological remarks: Appendix inverted; felt through cæcal wall.

CASE 149 (Delore, *Rev. d. Chir.*, 1908, 38, 39-62).—Male, age six. Prior history: Three or four previous attacks. Onset: Three days, acute. Tumor: Right lower quadrant. Visible coils. Operation: Enteric; irreducible; resection. Death. Pathological remarks: Inverted Meckel's diverticulum.

CASE 150 (Coffey, *ANNALS OF SURGERY*, 1907, xlv, p. 42-48).—Male, age seven. Prior history: At two years severe cramps with vomiting monthly, with bloody stool; at four years similar attack and jaundice. Onset of present attack, acute; pain and vomiting. Bowels: Tenderness of bowel. Rectal examination: Blackberry seeds and later black stool. Tumor: Large in right side. Operation: Ileocæcal; irreducible; resection after opening sheath. Cured. Pathological remarks: Inverted Meckel's diverticulum.

CASE 151 (Moroni, *Virchow. Hirsch. Jahres Bericht.*, 21, 1898, 289).—Male, age 26. Prior history: Operation for ileus; axial torsion. Onset: Recurrent obstruction. Death. Pathological remarks: Complete enteric invagination caused by turning inside out of Meckel's diverticulum, caused by cherry-sized fibrous polyp in Meckel's diverticulum.

CASE 152 (Ryan, *Intercolonial M. J. Austral.*, 1907, xii, 459-461).—Male, age 9. Onset: Acute; pain and vomiting. Operation: Lower iliac (6 inches from ileocæcal valve); resected 12 inches gangrenous gut; ends sutured in wound. Death. Pathological remarks: Starting of intussusception was firm polyp at apex.

CASE 153 (Cheyne, *ANNALS OF SURGERY*, xl, 1904, p. 796).—Male, age 19. Prior history: Two years indefinite abdominal pain. Onset: Nine months acute; vomiting recurrent. Operation: Triple: two reduced; third resected, showed Meckel's diverticulum as cause. Pathological remarks: Mucous membrane greatly prolapsed and hypertrophied.

CASE 154 (Cowardine, *Lancet*, 1904, Feb. 20).—Age fourteen months. Onset: Collapsed. Operation: Double ileal with Meckel's diverticulum. Death. Pathological remarks: Gangrene.

CASE 156 (Robinson, *B. M. J.*, 1899, ii, 1417).—Male, age 5. Onset: Pain and vomiting. Bowels: One stool. Distention; no rigidity; no tenderness; no tumor. Rectal examination: Blood with enema; lump in Douglas's pouch on bimanual examination. Operation: Reduced to inverted Meckel's diverticulum; excision; Lembert suture; enteric four inches long. Death.

CASE 157 (Eve, *B. M. J.*, 1901, ii, 582).—Refers to a case of inverted Meckel's diverticulum without clinical notes.

CASE 158 (Von Stubenrauch, *Cent. f. Ch.*, 1898, No. 26, p. 137).—Female, age 5½. Onset: Acute for five days; vomiting. Tumor: Moderate distention on fifth day; tenderness; sausage-shaped tumor in midline between anterior superior spines. Rectal examination: Blood and mucus; otherwise negative. Operation: Tear during attempted reduction; resection; circular suture; enteric. Death. Pathological remarks: Inverted Meckel's diverticulum at apex of invagination, in gangrenous condition.

CASE 159 (Erdmann, *Annals*, 1900, p. 186).—Male, age 9. Onset: Acute; pain and vomiting. Distention and tenderness; tumor from right iliac fossa to costal margin. Rectal examination: Blood and mucus; tenesmus. Operation: Operation fifty-eight hours after onset; irreducible and gangrenous; resection; end-to-end with Murphy button; enteric to within six inches of cæcum. Death. Pathological remarks: Inverted Meckel's diverticulum at apex.

CASE 160 (Adams, *Tr. Path. Soc.*, London, 1892, p. 75).—Male, age 42. Prior history: Three weeks' duration; obstruction first week; subsidence. Onset: Recurrence with vomiting. Tumor: None; fulness in right lower quadrant. Rectal examination: Blood once with enema. Operation: Ileocolic; gangrenous. Death. Pathological remarks: Inverted Meckel's diverticulum at apex.

CASE 161 (Küttner, *Beitrag*, No. 21, p. 289).—Female, age 49. Prior history: Acute attack eight weeks ago, lasting five days. Onset: Similar attack three days' duration. Operation: Anastomosis between distended and collapsed intestine. Death. Pathological remarks: Meckel's diverticulum intussusception, with three small perforations at base.

CASE 162 (Strauch, *Zeit. f. klin. Med.*, 38, p. 465).—Female, age 6. Prior history: Poor digestion; colic from time to time. Onset: Acute, vomiting. Bowels: Diarrhœa, followed by constipation. Tumor: Hard and elastic, below navel; tenderness. Operation: Reduction partial, then resection; circular suture; enteric. Death. Pathological remarks: Invaginated Meckel's diverticulum.

CASE 163 (Zum Busch, *Cent. f. Chir.*, 1903, p. 733).—Male, age 21. Prior history: Fourteen months dull pain about navel, with alternating constipation and diarrhœa; patient being an athlete, accustomed to holding many men on abdomen. Onset: Acute vomiting. Bowels: Several fluid stools with great tenesmus. Tumor and rigidity in right lower quadrant. Rectal examination: Frequently blood. Operation: Reduction

difficult; gangrenous; resection, side-to-side; "tumor" in intussusception; ileocolic. Recovery. Pathological remarks: Tumor proved an inverted Meckel's diverticulum, with subserous lipoma at apex; abscess in abdominal wall.

CASE 164 (Hohlbeck, *Archives Chir.*, Bd. 61, p. 1).—Male, age 18. Onset: Acute pain and vomiting. Bowels: No gas or stool. Tumor: Sausage-shaped, under anæsthesia in right lower quadrant. Rectal examination: No blood. Operation: Third day; reduction, showing Meckel's diverticulum at apex; resection of Meckel's diverticulum; ileocolic. Died.

CASE 165 (Travers, *Lancet*, 1902, ii, 146).—Male, age 10. Onset: Acute; vomiting. Bowels: Moved; slight tenesmus. Tumor: Over appendix, firm, tender and dull; no tumor in rectum. Rectal examination: No blood, mucus or flatus since primary attack. Operation: Reduction, except Meckel's diverticulum, which was partially reduced, so as not to obstruct gut; ileocolic into ascending colon. Recovery.

CASE 166 (Pitts, *B. M. J.*, 1901, ii, p. 578).—Male, age 15. Prior history: Had eaten pint of cherries. Onset: Pain and vomiting, becoming worse on fifth day. Tumor: None; distention great on fifth day. Rectal examination: No blood or mucus. Operation: Enterostomy; evacuation gas and contents; suture; reduction to inverted Meckel's diverticulum, removed by enterotomy; ileocolic to hepatic flexure. Recovery.

CASE 167 (Dobson, *Lancet*, 1903, i, 1161).—Male, age 4½. Onset: Pain and vomiting. Tumor: In right iliac fossa; soft; mobile. Rectal examination: Blood and mucus. Operation: Reduced to apex, where inverted Meckel's diverticulum projected into gut; resection of Meckel's diverticulum segment, not including mesentery; ileocolic. Recovery. Pathological remarks: No fecal fistula.

CASE 168 (Wainwright, *ANNALS OF SURGERY*, 1902, i).—Male, age 17. Gradual onset of six days; pain and vomiting twenty-four hours. Bowels: Constipation obstinate. No tumor; abdomen retracted; tenderness below. Rectal examination negative. Operation: Thirty-six hours after acute onset; complete reduction, including an inverted Meckel's diverticulum which was removed; enteric, three inches long. Recovery.

CASE 169 (Weil and Frankel, *Soc. Anat.*, 1896, p. 918).—Female, age 4½. Onset: Acute; pain and vomiting thirty-six hours. Bowels: Constipation. Cylindrical, tender tumor over appendix. Rectal examination: Blood. Operation: Reduction; gangrenous; resection; circular suture; ileocolic. Died. Pathological remarks: Meckel's diverticulum at apex.

CASE 170 (Brin, *Bull. Mem. Soc. d. Chir.*, 1908, 34, p. 1267-1279).—Female, age 39. Prior history: Attacks two to three times yearly for twelve years. Onset: During past year, tenderness between attacks. Pelvic tumor, thought to be salpingitis. Operation: Supravaginal hysterectomy; acute obstruction eight days later; reduced; evagination and resection of Meckel's diverticulum; iliac. Recovery. Pathological remarks: Inverted Meckel's diverticulum.

CASE 171 (Riedel, *Deut. Med. W.*, 1909, 1654).—Female, age 25. Onset: Acute pain. Bowels: Constipation; no stool or flatus. No tumor; tenderness over navel; distention slight. Operation: Resection; enteric.

Died. Pathological remarks: Meckel's diverticulum inverted and gangrenous.

CASE 172 (De Quervain, *Cent. f. Ch.*, 1898).—Male, age 16. Onset: Acute; pain and vomiting. Bowels: Several movements; one black stool. No tumor; distention moderate. Rectal examination: Negative. Operation: Resection; fixation of ends in wound; iliac. Died. Pathological remarks: Meckel's diverticulum; inner layers gangrenous.

CASE 173 (Ewald, *Berl. K. W.*, 1897, p. 169).—Female, age 42. Prior history: Repeated attacks of obstruction in seven months. Visible peristalsis. Death sudden, without operation. Pathological remarks: Intussusception of Meckel's diverticulum, with stricture of small intestine and perforation.

CASE 173a (Moore, *Per. communication*).—Twenty-five. Prior history: Several years abdominal colic; diagnosis, appendicitis. Onset: Twenty-four hours; acute. Operation: Reduction; resection of diverticulum; ileocolic. Recovery. Pathological remarks: Bowel dark but not gangrenous; one slight attack of colic since operation.

## TABLE H.

*Discharge of Necrotic Intussusceptum Per Rectum.*

CASE 1 (Catterina, *Clin. Chir.*, 1898).—Female, age 47. Onset: Acute; strangulation. Tumor: Round, oval, size of fist, slightly movable; para-umbilical. Operation: Irreducible invagination; anastomosis with Murphy button. Subsequent discharge of slough.

CASE 2 (Pozza, *Clinica Ch.*, 1901).—Female, age 37. Onset: Sudden; pain right side; vomiting, at length fecal. Rectal examination: Bloody mucus fourth day. Tenderness. Operation: Sixth day; entero-anastomosis, Murphy button. Discharged slough thirteenth day, 60 cm. long. Recovery. Slough consisted of ileum, cæcum and ascending colon; no vermiform appendix.

CASE 3 (Wechsberg, *Cent. f. All. Path.*, etc., 1900, p. 193).—Age, eighteen. Prior history: Acute gastritis; round worms. Onset: signs of peritonitis and fever. Bowels: Discharge of worms not followed by relief. Tumor: Variable position: (a) above navel; (b) right iliac fossa. Tenderness. Operation refused; discharge of slough, composed of cæcum and small intestine in second week. Recovery. End result: Fourteen months later, after several attacks of pain, acute obstruction; death; autopsy showed small intestine terminating in colon below hepatic flexure, with stricture and scars in ascending colon and splenic flexure.

CASE 4 (Schridde, *Münch. Med. Woch.*, Bd. 50).—Female, age 60. Prior history: Tubercular; signs of late stage. Onset: Pain lower right side; vomiting. Bowels: Stool at onset, afterward constipation. Rectal examination: First stool fifth day. Tenderness and distention; visible peristalsis. Discharge of slough on twelfth day; three months later death from acute pulmonary process. Recovery. End result: Autopsy showed annular stricture 36½ cm. above ileocæcal valve; visceral lesions.

CASE 5 (Hallmann, *St. Peter's Med. Wo.*, Bd. 28, 1903).—Male, age 49. Three months ago onset; pain and vomiting, followed by loss of appetite. Bowels: Very fluid stools. Rectal examination: Mucus and blood. Tumor: In left iliac region, disappearing on inflation. Discharge of slough at end of third month. Recovery. Slough consisted of ileum, cæcum and large intestine, with tape-worm still attached.

CASE 6 (Polya, *Owosi Hetilap*, 1905).—Male, age 44. Onset: Sudden; incomplete obstruction. Rectal examination: Tumor protruded from anus. Tumor: Beneath right border ribs. Slough 42 cm. long. Recovery. Cæcum, appendix and ileum. End result: Occasional recurrence of meteorism suddenly relieving itself.

CASE 7 (Hermes, *D. Zeit. für Chir.*, Bd. 77).—Male, age 23. Onset: Sudden; colic; pain on micturition; eight days duration. Distention and tenderness over bladder. Discharge of slough fourteenth day; secondary stricture of rectum cured by artificial anus and subsequent dilation. Recovery.

CASE 8 (Camhours, *Bull. Soc. Anat.*, 1906).—Female, age 23. Prior history: Tubercular family and personal history. Onset: Acute; pain. Bowels: Stools for five days. Rectal examination: Blood. Discharge of slough fifteenth day, consisting of portion of jejunum. Recovery. End result: Persistent distention with painful puffiness one month after discharge of slough.

CASE 9 (Hædke, *Med. Klinik.*, 1906).—Age  $3\frac{1}{2}$  months. Onset: Acute; vomiting five days' duration. Bowels: Constipation. Rectal examination: Blood; irreducible prolapse. Operation refused; stools recurred; death two days later. End result: "Autopsy showed nature healing as in strangulated hernia."

CASE 10 (Kolbe, *Deut. Med. Woch.*, No. 21).—Male, age 40. Prior history: Dyspepsia, distention, obstipation and hemorrhoids fifteen years. Onset: Three days colic; vomiting. Bowels: Profuse diarrhœa. Rectal examination: Blood and mucus; pus. No rigidity; borborygmi. Discharge of slough 20 cm. long. Recovery. End result: Marked improvement after slough was discharged.

CASE 11 (Solberg, *Norsk. Mag. for Læyrrid*, 1898).—Female, age 30. Onset: Acute obstruction. Discharge of slough fourteenth day. Recovery. End result: Eight weeks later death from second obstruction; no autopsy.

CASE 12 (Segal, *Jeshenêde Vrick*, 1898).—Male, age 56. Prior history: Constipation. Onset: Chronic; pain and frequency of urination. Thirteen days after admission discharge of slough, and two days later a second larger slough. End result: Improvement, followed by opening of abdominal abscess into bladder; persistence of pyuria and granular casts.

CASE 13 (Raven, *l. c.*).—Age 9. Onset: Acute; pain and vomiting. Bowels: Obstipation after primary stool. Distention, tenderness and rigidity. Operation; gangrenous loop; enterostomy; ten days later discharge through fistula of slough. Recovery. End result: Intermittent closure of fecal fistula; death four years later from neglected acute obstruction; autopsy showed almost complete stenosis two feet above valve.



CASE 14 (Chodkiewicz, *Kiel. Inaug. Dissert.*, 1878).—Male, age 20. Prior history with onset: Abdominal pain of long standing. Bowels: Diarrhœa. Rectal examination: Blood and mucus; intermittent. End result: Death after five and a half months; autopsy showed small intestine opening into transverse colon; the discharge of slough was unnoticed.

CASE 15 (O'Connor, *B. Med. J.*, 1894, p. 123).—Male, age 13. Onset: Three days after severe wetting; symptoms of obstruction and peritonitis. Discharge of slough of small intestine, with Meckel's diverticulum on about twelfth day. Recovery. End result: Twelve months after attack patient was well.

CASE 16 (Sutcliffe, *B. Med. J.*, 1894, p. 124).—Male, age 17. Onset: Acute, with symptoms of obstruction and peritonitis for twelve days. Discharge of slough of large intestine on seventeenth day. Recovery. End result: One week after discharge of slough recurrence of symptoms for five days; dysenteric stools persisted forty days.

CASE 17 (Slessor, *Lancet*, 1879, vol. ii, 909).—Age seven months. Onset: Pain. Rectal examination: Blood; dark gray membrane protruding. Tumor: Hardness lower part body. Twelfth day, passed cæcum, part of colon and appendix. Remarks: Well sixteen months; last heard.

CASE 18 (Schmidt, *D. Zeitsch. f. Chir.*, 1898, Bd. 48, p. 83).—Female, age 48. Prior history: Operation (Jan. 3) for carcinoma of stomach; pylorotomy. Onset: January 8; pain and vomiting. Bowels: Diarrhœa; thin, foul mucus. January 27 expelled six-inch section of colon; invaginated. Abscess appeared in upper angle of wound; death February 28; at autopsy stricture in middle of the transverse colon; specimen passed showed that intussusceptum was composed of that part of colon which was freed during the pylorotomy.

CASE 19 (Krabbel, *D. Med. Woch.*, 1879, No. 41, p. 525).—Female, age 44. Prior history: Child bed. Onset: Ninth day sudden pain and vomiting (fecal); collapse. Bowels: Constipation; thin diarrhœa. Tumor: Right side. Distention upper part of abdomen; visible peristalsis. Following calomel sudden improvement; bowels moved; later 48 cm. ileum in fair condition passed. Recovery. Pathological remarks: Death later of tuberculosis. Autopsy: 15 cm. above valve Bauhini a strong scar (circular) narrowing lumen of gut but not obstructing it; bowel somewhat dilated above.

CASE 20 (Kofmann, *Centralblatt f. Chirurgie*, 1895, 22, p. 941).—Female, age 22. Onset: Pain and vomiting; sudden. Bowels: Constipation; stool normal in three weeks (following tearing pain in right side), then diarrhœa. Tumor in left side; proved to be abscess; drained. Distention. Eight weeks after onset passed  $\frac{1}{4}$  m. bowel. Recovered. Remarks: Recurrence of obstruction symptoms; operation; search of small bowel caused rupture, just below it a stricture (complete) of jejunum thought to be site of intussusception.

CASE 21 (Hampelu, *St. Petersburg Med. Woch.*, 1883, Bd. 8, p. 161).—Female, age 43. Prior history: After lifting heavy burden, sudden pain and vomiting. Rectal examination: Blood; rectal mass. Tumor:

Left lower quadrant, movable. Tumor reduced bimanually; hand up to splenic flexure by rectum. Discharge and character of slough: Twenty-second day; 15 cm. bowel passed; ileocaecal with appendix, caecum and part of ascending colon. Recovery.

CASE 22 (Phelan, *Gaz. d. Hop.*, 1840, 14).—Age 18. Prior history of trauma: Severe blow. Onset: Pain and vomiting for fourteen days. Bowels: Constipation. Tumor: In right lower quadrant.

CASE 23 (Kriz, *Wien. Med. Press*, 1896, 49).—Female, age 38. Prior history: Three days constipation, then normal stool. Onset: Pain and vomiting. Rectal examination: Blood and mucus. No rigidity. Tumor: Smooth, sausage-shape, between hepatic and splenic flexures. Operation: Reduction by massage; recurrence after two weeks; operation refused; slough discharged seventeenth day. Recovery. Remarks: Stools feculent, fluid and foul.

CASE 24 (Parker, *B. M. J.*, 1896, ii, 840).—Male, age 27. Prior history: Colic and constipation; no vomiting. Onset: Gradual increasing pain; one month's duration. Bowels: Alternating diarrhoea. Rectal examination: Blood and mucus. Some distention. Discharge of slough ten to twelve inches long. Recovery. Remarks: After three years of good health death from obstruction in six weeks; invagination in lower descending colon.

CASE 25 (Marchand, *Berl. klin. Woch.*, 1896, 6).—Male, age 14. History of wrestling. Rectal examination: Intermittent blood. Operation: Spontaneous discharge of enteric slough. Death from peritonitis.

CASE 26 (Castelain, *Gaz. Hebdom.*, 1870, No. 20).—Male, age 43. Prior history: Habitual constipation. Onset: Loss of appetite; nausea. Bowels: Constipation. Rectal examination: Blood and mucus; tenesmus. Distention and rigidity: Case mentioned under benign tumor. Fourth week; discharge of large tumor with thin pedicle. Recovery. Pathological remarks: Lipoma.

CASE 27 (Ninans, *Verein d. Aert. in Steiermark*, 1871).—Male, age 32. Prior history: Intermittent attacks of pain for months. Onset: Acute; pain and vomiting for eight days. Bowels: Constipation. Rectal examination: Blood on eighth day. Operation: Twenty-sixth day; discharge of slough. Recovery. Pathological remarks: Intestinal segment has lipomatous polyp; mild obstruction symptom one year afterward; never well since.

CASE 28 (Albrecht, *Peters. M. Woch.*, 1880, No. 9).—Male, age 51. Onset: Pain, followed by diarrhoea. Rectal examination: Mucus and blood. Sixth week; discharge of pedunculated lipoma from large intestine.

CASE 29 (Wallenberg, *Berl. klin. Woch.*, 1864, 437).—Female, age 21. Prior history: History given under malignant growth. Discharge of lower ileum in connection with sarcoma of caecum.

CASE 30 (Ludloff, *Grenz. Gebiet.*, 1898, 3, p. 600).—Male, age 29. Prior history: Severe colicky pains. Bowels: No stool; no flatus. Rectal examination: Prolapse; invagination at rectum. Distention and tenderness persistent. In a few days discharge of slough, with temporary relief followed by local abscess, which was opened. Recovery.

CASE 31 (Balskow, *Monat. f. Unfall.*, 1905, p. 56).—Male, age 21. Prior history of trauma: Heavy lifting. Onset: Acute; pain and vomiting of six days' duration. Bowels: Constipation. Rectal examination: Mucus; blood on twelfth day. Rigidity and retracted abdomen; tenderness. Operation: Slough discharged on twenty-sixth day, consisting of ileum; cæcum; ascending colon. Recovery.

CASE 32 (Müller, *Strass. Med. Zeit.*, 1909, vi, 45-47).—Male, age 36. Onset: Sudden pain in right lower quadrant; diagnosis, appendix. Bowels: Constipation. Rectal tenesmus. Distention moderate; tenderness general. Discharge of slough with Meckel's diverticulum on it, twenty-first day; probably ileocolic. Died two weeks later from perforative peritonitis.

CASE 33 (Sohlern, *Mitth. aus d. Hamb. Staats.*, Bd. x, No. ii).—Male, age 35. Prior history: Varicose veins five years ago, with operation. Onset: Acute; pain and vomiting. Bowels: After four days no stool or flatus. Rectal examination: Blood and mucus after tenth day, with foul stools. Tenderness general; no visible peristalsis. No tumor. Discharge of slough, twenty-ninth day, containing rusty darning needle; enteric. Recovery. Remarks: Obstruction one month later; operation; stricture near duodenum; death after resection.

CASE 34 (Marnach, *Scot. M. and S. Trans.*, 1906, p. 176-184).—Male, age 3. Onset: Pain. Rectal examination: Blood and mucus; tenesmus. Tumor: In left lower quadrant. Slough passed tenth day. Recovery. Remarks: Well four years after.

CASE 35 (Sohlern, *Mitth. aus d. Hamb. Staats.*, Bd. x, No. ii).—Male, age 18. Prior history: Passage of eighteen round worms failed to relieve pain. Onset: Pain. Tumor: Size of fist in and over centre of abdomen. Slough passed; 4 cm. enteric; 8 cm. colon. Recovery. Pathological remarks: Fifteen months after, death from obstruction, autopsy showing scars in cæcum, splenic flexure and small intestine terminating by narrow orifice in ascending colon 16 cm. above cæcum.

CASE 36 (Kirchner, *Berl. k. W.*, 1886, No. 24).—Infant. After discharge of slough, subsequent complete obliteration developed.

CASE 37 (Wilson, *B. M. J.*, 1910, i, 375).—Male, age 45. Prior history of trauma: Lifting heavy weight; constipation. Onset: Acute; pain and vomiting. Bowels: Diarrhœa and then normal stool. Rectal examination: Blood and mucus after twenty-four hours; rectum negative. Abdomen retracted; tenderness general. Tumor: None. Discharge of transverse colon one week after onset. Recovery.

CASE 38 (Poisson, *Gaz. Med. de Nantes*, 1908, 25, 26, 336).—Female, age 23. Onset: Acute; vomiting and pains forty days ago. Rectal examination: Blood. Tumor: Below and to left of umbilicus. Discharge of slough on fifteenth day. Recovery. Pathological remarks: Early recurrence of obstruction; invagination three feet below pylorus; former invaginated segment makes angle with surface of mesentery; anastomosis between distended and collapsed coils. Recovery.

CASE 39 (Kummer, *Strass. Med. Zeit.*, 1908, v, p. 180).—Female, age 38. Onset: Acute obstructive symptoms. Bowels: Thin, watery stools,

followed by complete obstruction for two weeks. (Original diagnosis of gallstones.) Discharge of slough on eighteenth day; enteric. Recovery. End result not stated.

CASE 40 (Parker, *Surg. Gyn. and Obst.*, 1908, vii, 358).—Male, age 44. Prior history and onset: Six months continuous pain and vomiting, when he passed 12 inches of small intestine; relief for few weeks, followed by recurrence of symptoms. Operation: Irreducible; resection; lateral implantation; ileocæcal. Recovery. Pathological remarks: Numerous polypi in intestine and a large one at apex of invagination.

CASE 41 (Pullin, *B. M. J.*, 1896, i, 11).—Male, 79. Onset: Attacks of great abdominal pain with distention. Bowels: No flatus with enema. Tumor: To left of umbilicus. Slough passed thirteenth day. Recovery.

CASE 42 (Laurent and Paley, *Bull. Anat.*, 1897, p. 488).—Female, age 33. Onset: Acute; pain and vomiting. Bowels: Constipation. Distention, rigidity and tenderness. Tumor in right lower quadrant. Slough of cæcum and intestine passed on fifteenth day. Recovery. Recurrence of obstruction and death two weeks later.

CASE 43 (Pedrazzini, *Gaz. d. Osp.*, 1897, No. 136).—Male, age 12. Onset: Complete obstruction for eight days. Operation: Passage of slough of small intestine eighth day; enteric. Recovery.

The first 21 cases are described by Raven (*Mitt. aus den Hamb. Staatskr.*, Bd. x, Hft. 1). Other cases, also mentioned by Raven, and credited by him to Braun, Steinmeyer, Sandberg, Hirschsprung, Ayer and Cipriano (vide Bibliography under Raven), could not be traced by the writer and are therefore not included in this paper.

## DIVERTICULA OF THE LOWER BOWEL: THEIR DEVELOPMENT AND RELATIONSHIP TO CARCINOMA.

BY LOUIS BLANCHARD WILSON, M.D.,  
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UP to the present date, December 1, 1910,\* fifteen cases of diverticula of the lower bowel (1 of the cæcum, 12 of the sigmoid, and 2 of the rectum) have been operated upon at the Mayo clinic, St. Mary's Hospital. Four of these cases have proven to be carcinoma apparently arising upon diverticula. In view of the frequency of carcinoma of this portion of the alimentary canal, it is worth our while to enquire whether any pathologic relationship † exists between the two lesions, *i.e.*, diverticulitis and carcinoma.

It has previously been abundantly demonstrated<sup>1</sup> that a very high percentage of gastric carcinomata have their origin in islets of epithelium which have been segregated by scar tissue around the bases of gastric ulcers. Likewise, there is strong presumptive evidence<sup>2</sup> that primary carcinomata of the tip of the appendix arise in epithelium which has been segregated by obliteration of the lumen of that organ. Is a similar segregation of epithelium present in diverticula of the lower bowel, and, if so, may it furnish the favorable conditions for the development of carcinomata?

Of our 15 cases, nine were males and six females. The oldest patient was 73 years of age, and the youngest 41 years of age, with an average of 55 years. It will thus be seen that all of the patients were in the cancer-bearing period. It is also worthy of note that no clinical case of diverticulitis has been

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\* Originally read before the Richmond Academy of Medicine, October 25, 1910.

† Our cases will be herein presented from the pathologic standpoint only, a consideration of their clinical aspects being now in preparation by Dr. H. Z. Giffin.

found except in adults. The average duration of symptoms was two and one-half years; the longest period nine years, and the shortest three months. Four of the cases had carcinoma associated with diverticulitis and were clinically diagnosed carcinoma. Of the remaining eleven cases (diverticulitis or peridiverticulitis only) five gave symptoms which warranted a clinical diagnosis of carcinoma. One was diagnosed clinically "ovarian tumor," one "rectal tumor," one "pelvic tumor," one "pelvic peritonitis," one no clinical diagnosis (autopsy), and one was correctly diagnosed diverticulitis of the sigmoid. This record indicates not only the general character of the symptoms but also the extreme difficulty of differentiating clinically simple diverticulitis from carcinoma following diverticulitis, or from primary carcinoma.

The probable cause of diverticula of the colon has been thoroughly discussed in recent literature, summaries of which will be found in articles by Mayo, Wilson, and Giffin,<sup>3</sup> Giffin and Wilson,<sup>4</sup> Barbat,<sup>5</sup> Abbott,<sup>6</sup> and Hartwell and Cecil.<sup>7</sup> It may be stated briefly that diverticula of the lower bowel, while frequently following the course of vessels, probably owe their origin more to congenital weakness of the circumferential muscularis than to any other factor. That they so rarely develop and show inflammatory changes in the young may be due to the fact that the pressure of chronic constipation seems an important element in their development.

It is difficult to say whether or not all of the diverticula are initially true herniæ,—*i.e.*, contain all of the coats of the viscus,—and later become false through their mode of development, as is the opinion of Hartwell and Cecil.<sup>8</sup> Certainly we have found many colons so defective in both circumferential and longitudinal fibres, that with any considerable pocketing of the wall many areas would have exhibited no muscular coat. In any case it is certain that, as diverticula develop, their coats may become thinned to such an extent that the muscularis, if ever present, becomes imperceptible. This thinning of the walls, particularly of the distal portions, is often so great that one can readily understand how there may be



escape of the bacterial contents of the colon into the subserosa without actual rupture of the mucosa and submucosa. In several diverticula in our cases, this escape of bacterial irritants seems to have taken place without the epithelium within the hernia showing any inflammatory changes whatever (Plate I, Fig. 1). Just outside the submucosa and within the fat of the subserosa is a diffuse infiltration with leucocytes, accompanied, in some instances, with marked increase of fibrous tissue (Plate I, Figs. 2 and 3). At the same time the mucosa in the tip of the diverticulum appears to be perfectly normal (Plate I, Fig. 4). Especially is this so if the lumen of the diverticulum freely opens into the bowel (Plate II, Fig. 9, lower half). This is the condition which I have previously described<sup>9</sup> as *peridiverticulitis*. It is one which it seems to me it is important to recognize, since any symptoms arising from such an inflammation will be initially present in the peritoneum and not in the colon or diverticulum itself. Of course as an inflammatory tumor mass thus develops in the peritoneal fat close to the bowel, symptoms of obstruction may arise (Plate III, Fig. 12). It is possible that a more careful study of this condition of peridiverticulitis may lead to the recognition of symptoms which will aid in the earlier diagnosis of diverticula.

Whenever a diverticulum becomes impacted with feces, an inflammatory reaction of greater or less extent is set up within it (Plate II, Figs. 7 and 8). When, in addition to such impaction, there exists a greater or less occlusion of the lumen of the diverticulum, the inflammatory process is proportionately increased (Plate II, Figs. 9 and 10). Many diverticula have globular extremities with lumina, which are either very narrow or completely closed off from the lumen of the gut. The mucosa in diverticula of this type is always markedly thinned or entirely absent at the narrowed portions of the lumina, while within the tip it is either degenerating and disintegrating or shows low-grade proliferative changes (Plate II, Fig. 10, and Plate I, Fig. 5). These two types of change in the more or less completely segregated epithelium of the tip of the diverticulum are parallel in all respects with

## EXPLANATION OF PLATE I.

Fig. 1, Case IV (19305),  $\times 10$  diam.—Longitudinal section through tip of diverticulum passing through muscular coats of sigmoid. The diverticulum has no constriction of its lumen, contains no fecal mass, and has no inflammation in its walls (mucosa and submucosa). Within the fat tissue just beyond the outer end of the diverticulum, however, is a very marked inflammation.

Fig. 2, Case IV (19305),  $\times 200$  diam.—Fatty tissue from beyond end of diverticulum shown in Fig. 1. Note infiltration with leucocytes and increase of fibrous connective tissue, the result of chronic inflammation.

Fig. 3, Case II (16736),  $\times 7$  diam.—Longitudinal section through tip of a diverticulum from another case, similar to that shown in Fig. 1, but with large amount of fibrous connective tissue *around* the diverticulum in which the mucosa is normal. This specimen contained a large number of diverticula with inflammation only *around* most of them, and presented symptoms leading to a clinical diagnosis of carcinoma.

Fig. 4, Case XII (36504),  $\times 15$  diam.—Longitudinal section of tip of diverticulum similar to preceding but of slightly higher magnification.

The sections shown above illustrate what is meant by *peridiverticulitis* as distinguished from *diverticulitis*.

Fig. 5, Case VII (28835),  $\times 10$  diam.—Transverse section of tip of diverticulum in which the lumen was obliterated proximal to the point shown. The epithelium is here proliferating but has not invaded its submucosa. The specimen contained one diverticulum with fairly normal mucosa in its tip (Plate II, Fig. 8), and others almost obliterated by carcinoma (Plate III, Fig. 13).

Fig. 6, Case VI (21699),  $\times 10$  diam.—Longitudinal section of diverticulum, within the wall of which is well-developed carcinoma. The gross appearance of this specimen is shown in Plate III, Fig. 14.

PLATE I.

FIG. 1.



FIG. 2.

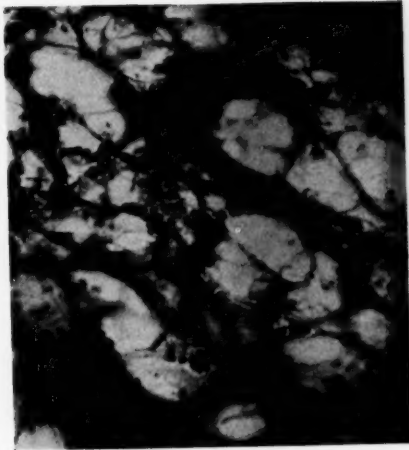


FIG. 3.

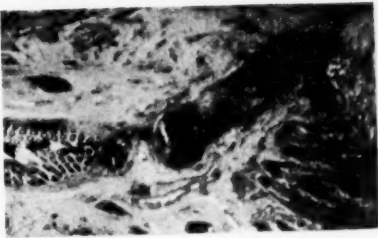


FIG. 4.

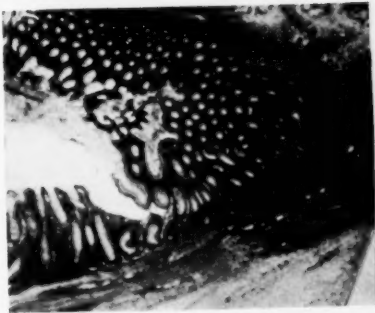
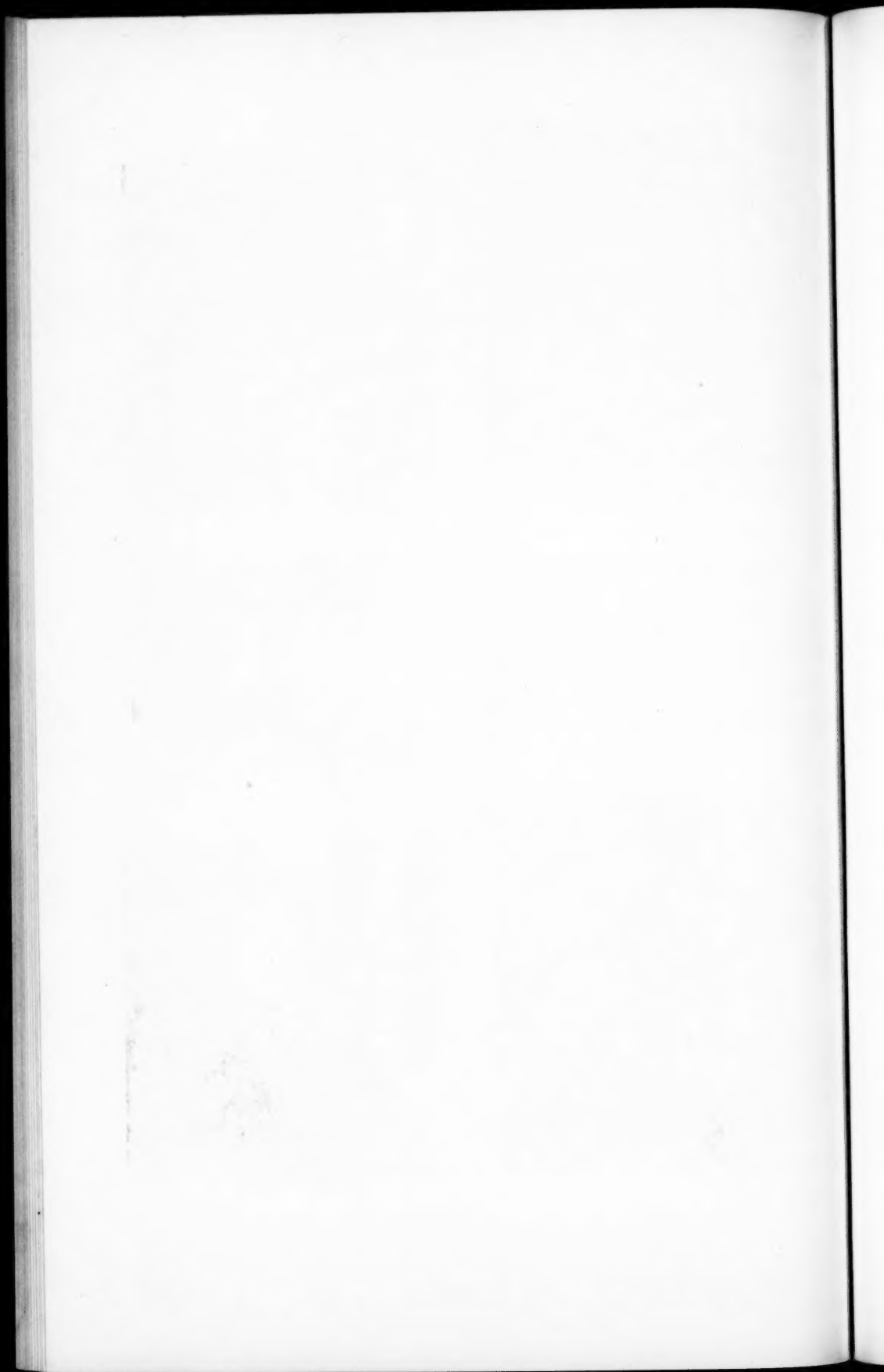


FIG. 5.



FIG. 6.





the cell changes which occur in masses of epithelium segregated about the base of the gastric ulcer. In other words, it appears that if the segregated epithelium has its blood supply materially reduced it degenerates and disintegrates. If, on the other hand, its blood supply is not materially interfered with it proliferates. This proliferation usually takes the form only of an increase in the number and size of the cells without any invasion of the basic connective tissue.

It seems to be but a very short step, indeed, from such an epithelial proliferation crowding the entire diverticulum, to the infiltration of its walls, thus forming a histologic picture which must be diagnosed as carcinoma (Plate I, Fig. 6).

Four of our cases of diverticulitis have well-advanced carcinomata developed on diverticula, though the latter are still unmistakable. Unfortunately we have found no very early carcinoma, and must confine our observations to the recently developing portions of old carcinomata in the cases at hand. In each of these, however, there are either diverticula which contain no carcinoma or diverticula which have only a very small portion of their walls carcinomatous (Case VII, Figs. 5, 8, and 13; also Case VI, Figs. 6 and 14). In all three of these there thus seems to be little doubt but that the carcinomata have developed on previously existing diverticula and have arisen therein from the epithelium which was previously segregated by inflammatory tissue.

The probable percentage relationship of carcinomata of the cæcum, sigmoid, and rectum to previously existing diverticula can at present only be conjectured. I am convinced that a great many cases, however, do so arise. Further, it seems probable that many cases of carcinoma of these areas, which still contain unmistakable remains of diverticula, have in the past been overlooked by surgeons and pathologists. The best time for the discovery of diverticular remains in carcinomata of the colon is immediately after the removal of the tissue from the body. If a glass probe with a bulbous point one millimetre or less in diameter be used very gently in the large pits of the cauliflower surface of a freshly removed carcinoma, which is

## EXPLANATION OF PLATE II.

Fig. 7, Case XV (38021),  $\times 1$  diam.—Two excised diverticula of the sigmoid (considerably shrunken by fixation). The one to the left still contains its fecal concretion. An inflammatory tumor mass surrounded the diverticula. This was palpable clinically and led to a diagnosis of carcinoma (patient's age 73 years) by several skilful diagnosticians.

Fig. 8, Case VII (28835),  $\times 2$  diam.—Clear diverticulum in case of carcinoma of the sigmoid, shown in Plate III, Fig. 13.

Fig. 9, Case IV (19305),  $\times 2\frac{1}{2}$  diam.—Two diverticula of sigmoid. In the lower the lumen is wide open and there is little inflammation, either within or around it. In the upper the lumen is much constricted, a fecal mass lies in the pouched tip, and the mucosa and the surrounding fatty tissue both show marked inflammatory changes.

Fig. 10, Case I (41903),  $\times 3\frac{1}{2}$  diam.—Diverticulum with lumen completely obliterated. Epithelium of tip proliferating.

Fig. 11, Case XII (36504),  $\times \frac{1}{3}$  diam.—Sigmoid containing two diverticula which are indicated by rubber-covered glass probes. Specimen shows the difficulty of finding the evidence of diverticula with the sigmoidoscope.



PLATE II.

FIG. 7.

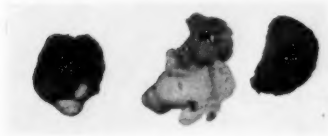


FIG. 9.



FIG. 8.



FIG. 10.

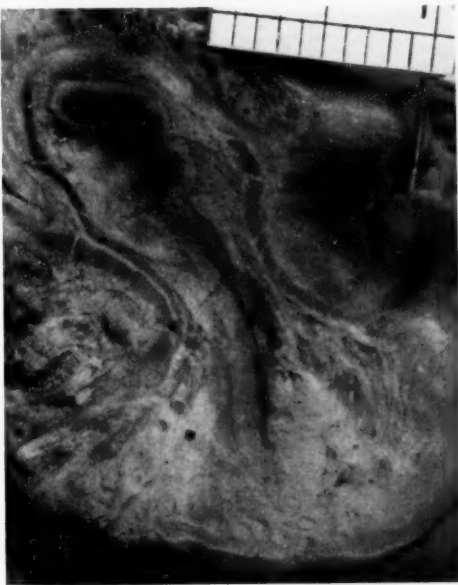
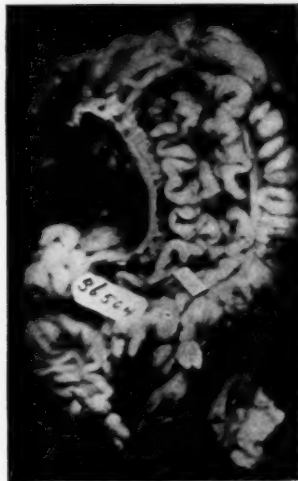


FIG. 11.





not badly ulcerated, there is a fair chance of discovering any existing diverticula without destroying their mucosa (Plate II, Fig. 11). When diverticula are suggested by the probe slipping deeply into the tumor, they may be more perfectly demonstrated by slicing the tumor mass into thin layers parallel with the surface of the bowel and beginning on the peritoneal side (Plate III, Figs. 15 and 16). This method may also be employed with good effect in hardened specimens, though it will here require the utmost care to determine the presence of small calibred diverticula. When a diverticulum is thus unmistakably demonstrated, it is best studied by a section parallel with its lumen and with the long diameter of the bowel. The adoption of some such method of examination as above indicated as a routine examination, especially of fresh tissues, will, I believe, undoubtedly result in the discovery of diverticular remains in a very large percentage of relatively recently developed carcinomata of the cæcum, sigmoid, and rectum, and it seems probable that before very long some one will have the pleasure of discovering a carcinoma in a very early stage of development from the segregated mucosa of a diverticulum. In thus calling attention to the importance of recognizing segregated epithelium as a point of least resistance for the development of carcinomata, I wish to disclaim any intention to eliminate other agents as essential etiological factors in the genesis of tumors.

#### SUMMARY.

1. Fifteen cases of diverticula of the lower bowel have been studied to date, December 1, 1910.
2. Three of these were cases of *peridiverticulitis*. In these the inflammation did not involve the mucosa. Its presence in the peridiverticular fat was apparently due to leakage through the thin-walled diverticula—a condition similar to that met with in old umbilical herniæ. Their symptoms were those of peritonitis or obstruction from pressure.
3. In four cases carcinomata had developed in the diverticula, probably from epithelium segregated by chronic inflammation.

## EXPLANATION OF PLATE III.

Fig. 12, Case XIV (37503),  $\times \frac{1}{2}$  diam.—Transverse section through wall of sigmoid showing diverticulum (at left) and large inflammatory mass external to it.

Fig. 13, Case VII (28835),  $\times \frac{3}{8}$  diam.—Longitudinal section through sigmoidal wall, showing carcinoma containing remains of diverticulum. See also Fig. 5, Plate I, and Fig. 8, Plate II, for sections of other diverticula from same case.

Fig. 14, Case VI (21699),  $\times \frac{2}{3}$  diam.—Transverse section of sigmoid, showing gross appearance of carcinoma mass and its contained diverticulum, which is shown magnified in Plate I, Fig. 6.

Fig. 15, Case X (35351),  $\times \frac{2}{3}$  diam.—Section parallel with and close to outer surface of tumor mass in case of carcinoma of the rectum. The transverse sections of the tips of two diverticula are seen close together near the centre of the photograph. The picture illustrates the plan suggested in the text for searching for diverticula in carcinomata of the lower bowel.

Fig. 16, Case X (35351),  $\times \frac{2}{3}$  diam.—Longitudinal section through wall of rectum at right angles to the section shown in Fig. 15 and opening longitudinally, for a considerable portion of their length, the two diverticula shown in Fig. 15. At the right is seen in section the large "cauliflower" carcinoma which had its origin within the diverticula, and which, as it developed, so distorted and filled their lumina that their openings were missed when probing from the mucosal side of the tumor.

PLATE III.

FIG. 12.

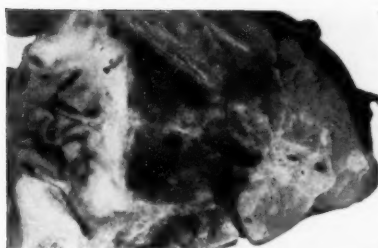


FIG. 13.



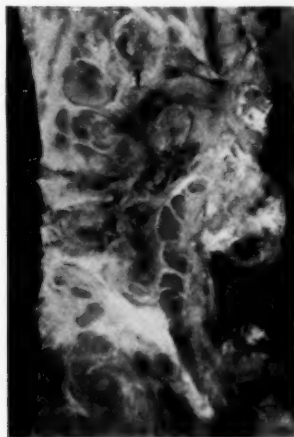
FIG. 14.



FIG. 15.



FIG. 16.







## REFERENCES.

- <sup>1</sup> Wilson and MacCarty: American Journal of Medical Sciences, Dec., 1909, vol. cxxxviii, pp. 846-852.
- <sup>2</sup> Wilson: Journal American Medical Association, Sept. 10, 1910, vol. lv, pp. 921-923. MacCarty: *Ibid.*, Aug. 6, 1910, vol. lv, pp. 488-491.
- <sup>3</sup> Mayo, Wilson and Giffin: Surgery, Gynæcology, and Obstetrics, July, 1907, vol. v, pp. 8-15; Trans. American Surg. Assn., 1907, pp. 240-244.
- <sup>4</sup> Giffin and Wilson: American Journal of Medical Sciences, Nov., 1909, vol. cxxxviii, pp. 661-666.
- <sup>5</sup> Barbat: Surgery, Gynæcology, and Obstetrics, March, 1910, vol. x, pp. 295-299.
- <sup>6</sup> Abbott: Journal of the Minnesota State Medical Association, March, 1910, vol. xxx, pp. 118-119.
- <sup>7</sup> Hartwell and Cecil: American Journal of Medical Sciences, Aug., 1910, vol. cxl, pp. 174-203.
- <sup>8</sup> Hartwell and Cecil: *Loc. cit.*
- <sup>9</sup> *Loc. cit.*, Ref. No. 5, p. 9.

## ON THE COINCIDENCE OF VOLVULUS AND REAL OR SIMULATED STRANGULATED HERNIA.

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STRANGULATED hernia remained for years one of the most formidable surgical problems. Within the more recent time its management has been freed of the major difficulties, a fact which has been brought about largely by the development of a clearer conception of the pathological process, more accurate and earlier diagnosis, the substitution of regional in place of general anaesthesia, and, finally, improvement in the therapy instituted in the presence of gangrenous gut. So complete has been the development that at present the problem is considered commonplace. It may be truly said that there is to-day no general realization of the frequent and formidable variations from the type case; and it is just as true that these variations, escaping recognition, are contributing heavily to our mortality.

Late years have brought an increasing number of reports of two interesting complications of the strangulation of herniated bowel, viz.: (1) the coincidence of volvulus, and (2) so-called retrograde incarceration.<sup>1</sup> One has but to pursue the recent literature, sparse as it is, perhaps, to become convinced that at the present time these conditions are more common than supposed and are frequently the explanation of unexpected fatality following an apparently satisfactory operation.

In a two-fold endeavor to draw attention to the association of volvulus with actual or simulated strangulated hernia and to contribute to its study, the writer presents two cases

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<sup>1</sup> Involvement in nutritional changes of the intra-abdominal "joining loop" between two strangulated loops.

recently occurring in his service at St. Francis Hospital, together with abstracts of the cases reported since Knaggs's paper in this JOURNAL in 1900. By a collective study of these cases attempt is made to bring out certain important diagnostic features which are of established value.

CASE I.—*Symptoms of acute intestinal obstruction accompanied by signs of strangulated inguinal hernia. Operation. Volvulus of ileum, one loop of which incarcerated in hernia sac. Reduction of volvulus. Death. Autopsy.*

H. M., male, colored, aged 63 years, laborer. Patient was admitted June 5, 1910, at 4 P.M., with a history of strangulation of a right inguinal hernia for the previous nine hours, accompanied by the typical picture of vomiting, absolute constipation, and pain about the rupture. The hernia had been present for years. Upon examination the patient was found to be a well-developed man of large frame. He was decidedly shocked and suffering acutely with pain about the hernia and over the abdomen. Surface temperature was markedly reduced, his face and hands were cyanotic, cold, and clammy, and his facial expression was one of extreme anxiety. There was a right inguinal hernia presenting as a moderately tender, tympanitic mass about the size of one's fist and occupying most of the scrotum. The abdomen was considerably distended, symmetrical, and generally tympanitic. Palpation was negative. Peristalsis was not visible. His pulse was weak, 100 to the minute. Leucocytes 14,000. Temperature not recorded.

The examiner was impressed with the extreme degree of shock which seemed quite out of proportion to the local signs about the hernia, but in spite of this made a diagnosis of strangulated hernia containing bowel. Immediate operation was proposed and accepted.

*Operation.*—Morphia, gr.  $\frac{1}{6}$ , was given hypodermically and anæsthesia maintained throughout the operation by the local injection of novocaine solution 0.5 per cent. The sac of an acquired indirect right inguinal hernia was opened and found to contain a considerable quantity of foul-smelling, turbid fluid, together with an œdematous, dark-blue loop of greatly distended small bowel about ten inches in length. Both the gut and its mesentery showed numerous ecchymoses. After division of

the constriction, which occurred at the internal ring, there was found a fairly well-marked compression ring on each limb of the loop; up to this time it was thought that we were dealing solely with a strangulated hernia containing bowel. The gut was now drawn out of the abdomen to facilitate examination of the supposedly strangulated loop, whereupon it was discovered that the proximal bowel above the hernia presented exactly the same dark-blue ecchymotic appearance. Attempt was then made to draw out the distal loop, but this was found to be firmly held within the abdomen and could not be dislodged. The finger introduced into the abdomen met with a hard mass just inside of the internal ring. The condition evidently demanded exploration, and the incision was accordingly enlarged, whereupon a considerable quantity of thin bloody fluid escaped from the abdomen. It was then possible to draw out the cyanotic proximal loop up to the point of its abrupt transition into normal though distended bowel; from this transition point distally for a distance of two or three feet the bowel presented uniformly the same dark-blue appearance as that of the loop originally found in the hernia sac and finally passed beneath a taut band of tightly twisted mesentery. The condition was then immediately recognized as a volvulus, and the whole mass grasped and rotated  $360^{\circ}$  in a direction opposite to the hands of a clock, whereupon the distal loop was freed and could be readily followed to the cæcum, about three inches of normal bowel intervening between the lower limit of the volvulus and the cæcum. This manœuvre plainly restored normal relations.

The twisted loop was of very questionable viability but had a definite mesenteric pulse and, inasmuch as the patient's condition was so urgent as to absolutely exclude a successful enterectomy, the bowel was drained of a considerable quantity of foul bloody fluid through a stab wound which was then immediately closed by suture, the bowel replaced in the abdomen, and the wound hurriedly closed about three small drains to the suture line.

The patient died seventeen hours after operation, having passed during this time three copious, bloody, fluid stools.

Autopsy revealed a perfectly black gangrenous loop of bowel about thirty inches in length, terminating below at a point three inches above the ileocæcal valve. The mesentery of this gan-

grenous loop was greatly lengthened and thickened, being quite evidently the site of old as well as recent inflammatory changes. The mesenteric vessels supplying this loop were thrombosed—both veins and arteries. Intra-abdominal conditions were otherwise normal, there being no point of intestinal obstruction. One could readily reproduce the volvulus, whereupon the observations made at operation were confirmed. Further autopsy findings had no bearing on the case other than as showing general senile changes.

CASE II.—*Symptoms of acute intestinal obstruction, accompanied by signs of strangulated inguinal hernia. Operation. Intrahernial volvulus of cæcum, loop of ileum, and appendix. Intra-abdominal obstruction of the oral bowel apparently due to a second volvulus. Restoration of normal relations. Recovery.*

A. R., male, white, aged 72 years, laborer. A fleshy man of large frame with marked general arteriosclerosis, myocarditis, and emphysema. There was an enormous right indirect inguinal hernia reaching half way to the knees; this hernia had been present for years and had always been reducible, though with increasing difficulty during the past year. Attempted reduction at the time of admission was painful and not persisted in, since the hernia was causing no symptoms. He was admitted on account of a varicose ulcer upon the right lower leg, and was put to bed and the leg elevated. His bowels did not move very freely, and he received upon the evening of the fifth day after admission two compound cathartic pills. At 10 A.M. of the sixth day, while at stool for the second time, the patient complained of sudden pain in the hernia, which he felt "come down" and which reached a larger size than ever before. "Crampy" pain soon appeared and was followed an hour after onset by vomiting; an hour later general abdominal "crampy" pain became severer and the patient vomited a second time.

Upon examination the hernia was found to have attained enormous proportions; it was very tense, somewhat tender, and tympanitic over its lower pole. The abdomen was not distended but was generally tender. There was no visible peristalsis. Attempts to reduce the hernia were futile. Within an hour after the first pain the patient showed extreme shock; his face was drawn and ashy in appearance, lips pale, hands cold, pulse 84 to the minute and irregular, temperature 97.2°. Leucocytes

18,600. His appearance was very striking and, as in Case I, the disproportion between the degree of shock and the amount of change in the hernia was pronounced. A diagnosis of strangulated hernia was made, however, and immediately operation proposed.

*Operation.*—Under local anæsthesia the hernia sac was opened within three hours after the onset of symptoms. The sac contained some turbid fluid together with the cæcum, appendix, and a short loop of ileum, all three of which were moderately cyanotic and œdematous. The posterior surface of the cæcum presented anteriorly, the ileocæcal valve being situated upon its external lateral aspect, the ileum passing behind it and to the right, the appendix emerging from behind the cæcum to pass lower into the sac; the herniated bowel had evidently rotated  $180^{\circ}$  from the right posteriorly to the left, producing an intrahernial volvulus. There was little sign of strangulation of this twisted bowel, but it is to be noted that symptoms had been present only three hours. Rotation  $180^{\circ}$  from the left posteriorly to the right easily untwisted the gut. The mesocæcum was rather voluminous, and the wall of all the herniated bowel was thickened by a chronic rather than an acute inflammatory process, which gave one the impression that this bowel had frequently if not always assumed this twist of  $180^{\circ}$  when occupying the hernia sac.

The neck of the sac was now examined and found widely patent, there being no evidence of constriction at this point. Furthermore, neither upon oral or aboral limb of the herniated loop was there found a compression ring. The bowel proximal to the herniated loop was pulled out and found not especially distended. These findings disproved the diagnosis; exploration was evidently demanded, and the incision accordingly enlarged. The proximal bowel was now further drawn out by gentle traction; during this process it was felt suddenly to give as though released from some intra-abdominal constriction, after which it extruded itself into the wound without help. Its appearance was striking. A loop of small bowel 32 inches in length was greatly distended, œdematous, and very cyanotic, showing numerous ecchymoses in its wall and mesentery; proximally and distally this loop terminated abruptly, its lower limit being situated 20 inches above its ileocæcal valve. Between this loop and the herniated portion of the ileum, there intervened four inches



of normal collapsed bowel. There did not seem to be a marked degree of distention above this loop. It was quite evident that this cyanotic loop had been the site of intra-abdominal strangulation, the exact nature of which could not be investigated because of the patient's urgent condition.

There seemed two possibilities, viz.: torsion of this loop or its knuckling over the taut mesentery of the herniated bowel, this latter being much the least probable, inasmuch as this mesentery was not found tensely stretched when the sac was opened, nor did the cæcum and adjoining ileum exhibit circulatory changes indicative of such stretching.

In spite of the patient's unpromising condition, chloroform anæsthesia became necessary to make possible the return of the bowel to the abdomen, and the wound was hurriedly closed. The patient gradually reacted under active stimulation, and subsequently had a slow but uninterrupted convalescence.

These two cases represent a clinical group whose importance and study are at present exciting attention. An occasional case has found its way into print from time to time, but it is only within recent years that there has begun a systematic study which is bringing an increasing number of reports of individual cases, and which, it is to be hoped, will add to our means of diagnosis. There can be no question but that the combination of some type of internal strangulation with real or simulated strangulated hernia is of more frequent occurrence than at present appreciated. There are numerous reported cases in which, after an apparently satisfactory operation for strangulated hernia, autopsy has revealed a second intra-abdominal strangulation, and we may hence reasonably infer a certain number of such cases where failure to make a post-mortem examination has allowed the surgeon to take refuge in such unconfirmed diagnoses as shock, intestinal paresis, or peritonitis.

The clinical picture is a fairly definite one. An individual, generally well past middle life, sickens suddenly with all the signs of intestinal obstruction, accompanied by more or less marked pain, tenderness, and increase in size in a long-standing

hernia. Abdominal tenderness may be present but is generally overlooked, since the rupture dominates the scene. The hernia may be readily reduced by taxis, or, more frequently, open operation reveals an incarcerated or strangulated loop of bowel which the operator disposes of to his entire satisfaction. After operation, the patient continues to vomit, constipation persists, the symptoms of obstruction become more violent and soon eventuate in death. Autopsy reveals a second unsuspected intra-abdominal lesion, volvulus being of frequent occurrence, though there have also been found the other types of internal strangulation, a slowly stenosing neoplasm of the large bowel (Hochenegg), and even general peritonitis (Clairmont).

It is especially with the coincidence of volvulus and hernia that this paper deals. The group is a large one, including both simulated and actual hernia. The dominant feature is always acute intestinal obstruction. Strangulated hernia may be complicated by volvulus of an intra-abdominal oral loop; there may be a volvulus, one loop of which finds its way into the hernia sac to become incarcerated and simulate strangulation or to become actually strangulated, or, again, the torsion may occur within or just above the neck of the sac, when both factors may contribute simultaneously to the production of strangulation within the hernia sac. The group thus presents a complicated picture. Knaggs, in 1900, proposed four groups, viz.:

Group I: Volvulus of a portion or all of the herniated bowel.

Group II: Volvulus of the small bowel, one loop of which becomes herniated.

Group V: Volvulus of the herniated bowel immediately after its reduction.

Group VI: Volvulus of the herniated bowel long after its reduction.

Two additional groups must now be added, viz.:

Group III: Volvulus of a distant oral loop above an actually strangulated hernia.

Group IV: Volvulus, generally of the large bowel, distal to a simulated strangulated hernia.

There follow the abstracts of the collected cases, all of which, with one or two exceptions, have appeared since 1900.

GROUP I.—*Volvulus of a portion or all of the herniated bowel.*

1. STEWART (ANNALS OF SURGERY, vol. xxxiv, p. 316).—Male, aged 50 years. Right inguinal hernia present 8 years. Symptoms of strangulation 2 days. Sac contained one foot of ileum twisted  $130^{\circ}$  from right to left. Recovery. ". . . patient presented evidence of peritonism out of all proportion to the condition found at operation."

2. ERDMAN (ANNALS OF SURGERY, vol. xxxiii, p. 203).—Female. Strangulated ventral hernia. ". . . complete torsion of the coil of intestine which filled the hernia sac." Excision of 12 inches of bowel. Recovery.

3. KOERBER (*Deutsche Zeitschrift für Chirurgie*, vol. lxxxix, p. 249, 1907).—Female, aged 62 years. No previous history of hernia. Strangulated about 12 hours. Right inguinal hernia sac contained 16-18 cm. small bowel twisted  $180^{\circ}$ , vessels of mesentery thrombosed, and extensive retrograde mesenteric thrombosis. Resection. Recovery.

4. KLAUBER (*Münchener medicinische Wochenschrift*, 1907, p. 1986; quoted from Clairmont, Langenbeck's *Archiv für klinische Chirurgie*, vol. lxxxviii, p. 631, 1908).—Hernia strangulated 24 hours. Findings: loop of small bowel twisted  $180^{\circ}$  just above neck of sac. Reduction of torsion. Recovery. Note: taut mesentery palpated through internal ring.

5. KNAGGS (*Lancet*, 1900, p. 1726; quoted from Clairmont, *Ibid.*).—Female, aged 61 years. Femoral hernia, strangulated for 6 days. Sac contained a gangrenous loop which was twisted  $180^{\circ}$  right to left just above neck of sac. Resection. Death.

6. CLAIRMONT (*Ibid.*).—Male, aged 75 years. Right inguinal hernia for 50 years. Symptoms of strangulation for over 12 hours. Contents reduced unexpectedly at operation before sac was opened. Closure without exploration. Death on fourth day. Autopsy: volvulus of necrotic loop formerly in hernia sac.

7. DOBSON (*The Lancet*, March 6, 1909, p. 679).—Male, aged 68 years. Right inguinal hernia for years. Symptoms of strangulation for 24 hours. Operation: volvulus of 2 or 3 feet of small bowel through  $360^{\circ}$ ; some loops of volvulus in hernia sac but not strangulated.

8, 9, 10. BRZOSOWSKI (*Chirurgie*, Bd. xix, Nr. III, Russian; abstract in *Zentralblatt für Chirurgie*, vol. xxxvii, No. 9, p. 254).—Three cases. In each case part of hernial contents involved in a volvulus of  $180^{\circ}$ - $270^{\circ}$  from right forward to left. "Irreducible hernia, which though exaggerated distention of a loop, simulates incarceration."

11-17. KNAGGS (seven cases reported in 1900).—Male, 4; female, 2; not stated, 1. Average age, 58 years. Average duration of hernia, 26 years. Inguinal hernia, 5; femoral hernia, 1; duodenal hernia, 1. Bowel in hernia sac gangrenous in 2 cases. Four deaths.

SUMMARY OF GROUP I.—Cases, 17. Male, 7; female, 5; unknown, 5. Average age, 61 years. Average duration of hernia, 27 years. Type of hernia: inguinal 9; right 6, left 2, not stated 1; femoral, left 1, not stated 1; umbilical 1; duodenal 1; type not stated, 4. Recovery, 7. Death, 6. Result not stated, 4.

GROUP II.—*Volvulus of the small bowel, one loop of the volvulus occupying the hernia sac.*

1. MILLER.—The writer's Case I.

2. KNAGGS (*The Lancet*, March 6, 1909, p. 676).—Male, aged 60 years. Left inguinal hernia 20 years. Symptoms of strangulation 13 hours. Sac contained 2 feet of congested small bowel with hemorrhagic mesentery. Compression rings on bowel well marked. Autopsy on sixth day: volvulus left to right of 6 to 8 feet of ileum, which showed definite but not excessive circulatory changes, excepting that loop formerly occupying the hernia sac, which was gangrenous.

3. KNAGGS (*Ibid.*).—Male, aged 62 years. Right inguinal hernia 11 years. Symptoms of strangulation 6 to 10 hours. Sac contained 18 inches of congested ecchymotic ileum. Ring loose. No compression rings on bowel. Volvulus right to left 180°, 4 feet of ileum. Recovery.

4. KNAGGS (*Ibid.*).—Male, aged 41 years. Left inguinal hernia 4 years. Symptoms of strangulation 2 to 3 days. Sac contained 12 inches of dark-red ileum. Neck of sac not constricted. No compression rings on bowel. Volvulus of about 2 feet ileum, 180° right to left. Recovery.

5. DOBSON (*The Lancet*, March 6, 1909, p. 679).—Male, aged 45 years. Right inguinal hernia for years. Symptoms of strangulation 48 hours. Enlargement and tenderness of hernia with palpable abdominal mass in right lower quadrant. Volvulus of 8 feet of ileum with one loop in hernia sac. Death.

6. PRUTZ (*Archiv für klinische Chirurgie*, 1900, Bd. 60, p. 323; quoted from Clairmont, *Ibid.*, Bd. 88).—Male, aged 48 years. Pain 3 days. Hernia irreducible 2 days. Sac contained black loop. No constriction at neck of sac. Volvulus 200° to right of large part of small bowel. Resection. Death.

7. WECKSBURG (*Zeitschrift für Heilkunde*, 1902, Bd. 23, p. 39; quoted from Clairmont, *Archiv für klinische Chirurgie*, Bd. 88).—Female, aged 28 years. Right femoral hernia. Herniotomy. Persistent symptoms. Laparotomy. Volvulus of entire small bowel.

8-12. KNAGGS (five cases were reported in 1900).—Male, 1; female, 4. Average age, 50 years. Average duration of hernia, 15 years. Inguinal hernia, 1; femoral hernia, 3; umbilical hernia, 1. Bowel gangrenous in 2 cases. Death, 4 cases.

SUMMARY OF GROUP II.—Cases, 12. Male, 7; female, 5. Average age, 49 years. Average duration of hernia, 13 years. Type of hernia: inguinal 6; right 3, left 3; femoral 4; right 2, left 1, unknown 1; umbilical 1; not stated 1. Recovery, 4. Death, 8.

GROUP III.—*Volvulus of a distant oral loop above the hernia.*

1. MILLER.—The writer's Case II.

2. SICK (*Beiträge zur klinische Chirurgie*, Bd. 57, p. 336).—Female, aged 46 years. Left inguinal hernia 10 years. Enlargement of hernia 4 days. Symptoms of intestinal obstruction 3 days. Gangrenous loop in sac. Probable volvulus of intra-abdominal oral loop. Resection of gangrenous loop. Death.

3. SICK (*Ibid.*).—Female, aged 62 years. Subacute obstruction 4 days. Laparotomy. Gangrenous loop of small bowel strangulated in obturator hernia. Volvulus 200° in direction of hands of clock of most of bowel above hernia. Resection of gangrenous loop. Recovery.

4. BORSZEKY (*Beiträge zur klinische Chirurgie*, vol. liv, p. 350).—Male, aged 26 years. Double reducible inguinal hernia. Symptoms of intestinal obstruction 3 days. Laparotomy. Strangulated right obturator hernia. Volvulus of a greatly distended oral loop. Recovery.

5. KAYSER (*Deutsche Zeitschrift für Chirurgie*, Bd. 55, Heft 5 and 6; abstract from *Jahresbericht über die Fortschritte der Chirurgie*, 1900, p. 641).—Male, aged 49 years. Inguinal hernia. Sac contained incarcerated volvulus of cæcum and incarcerated loop of ileum. Intra-abdominal volvulus of ileum above the hernia. Death. (Note similarity to writer's Case II.)

SUMMARY OF GROUP III.—Cases, 5. Male, 3; female, 2. Average age, 51 years. Inguinal hernia, 3; average duration, 10 years. Obturator hernia, 2; average duration unknown. Recovery, 3. Death, 2.

GROUP IV.—*Volvulus of a distant aboral loop below the hernia.*

1. ROKITANSKY (reported in 1836; quoted from Clairmont, *Archiv für klinische Chirurgie*, Bd. 88).—Male, aged 54 years. Admitted moribund with large incarcerated left inguinal hernia. Autopsy: volvulus of cæcum and ascending colon. Proximal bowel greatly distended. Sac contained loop of ileum, which was slightly constricted by sac.

2. RICHET (quoted from Knaggs, *ANNALS OF SURGERY*, vol. xxxi, p. 427, 1900).—Male, aged 60 years. Right inguinal hernia 20 years. Symptoms of subacute intestinal obstruction 7 days. Reduced by taxis with difficulty. Symptoms persisted. Death. Autopsy: acute angle between cæcum and ascending colon. Proximal bowel greatly distended. It is remarked that the appearance of the cæcum suggested its former presence

in the hernia sac and Knaggs classes this case in Group V, viz.: volvulus immediately following reduction of a hernia. Considering its striking resemblance at autopsy to Rokitsansky's case, however, the probable diagnosis seems to be volvulus of the cæcum with incarceration of a proximal distended loop in a right inguinal hernia.

3. DONA (*Revista de Chirurgie*, No. 4, p. 182, 1901, No. 10, p. 463; abstract from *Jahresbericht über die Fortschritte der Chirurgie*, 1902, p. 780, vol. vii).—Male, aged 48 years. Right inguinal hernia for years. Laparotomy for intestinal obstruction finding volvulus of sigmoid. Reduction. Death eighth day from pulmonary oedema. Autopsy: high loop of ileum passing beneath sigmoid to enter the hernia sac. Moderate stenosis caused by pressure of sigmoid. Loop in sac not strangulated.

SUMMARY OF GROUP IV.—Cases, 3. Male, 3. Average age, 54 years. Average duration of hernia probably over 15 years. Type of hernia: inguinal 3; right 2, left 1. Volvulus of portion of large bowel in each instance. Recovery, none. Death, 3.

GROUP V.—*Volvulus of herniated loop immediately after its reduction.*

Knaggs includes two cases under this heading. In one, autopsy after operation upon an infant 16 hours old for hernia into the umbilical cord showed volvulus of a portion of the small bowel. The second case has been tentatively classified under volvulus of aboral bowel (Richet).

GROUP VI.—*Volvulus of the herniated loop long after its reduction.*

Knaggs includes here two cases in which individuals, both possessors of a hernia of long standing, were stricken suddenly with intestinal obstruction, the hernia altering in no way with the onset. Autopsy showed in one case a ruptured volvulus of the loop of small bowel supposedly the usual hernia occupant. Operation in the second case showed a volvulus of the small intestine, whose relation to the hernia, however, was doubtful.

Since 1900 no new cases for Groups V and VI were found in the literature; it seems impossible that they are as infrequent as this might indicate.

As to the mechanism concerned in these cases, we must base our ideas upon the generally accepted teaching concerning volvulus. Wilms, the acknowledged authority, believes that the loops of small bowel in normal motion frequently assume positions which twist their mesentery, and that these twists correct themselves spontaneously; that is, potential volvulus occurs frequently and is a perfectly normal state. However,



if for any reason, such as slight distention, intestinal stasis, etc., a twisted loop cannot readily empty itself, peristalsis increases, the twist becomes more pronounced and eventually cannot right itself; in other words, potential volvulus may pass into actual volvulus in the presence of even a slight hindrance to the intestinal current. Once established, a volvulus draws in more and more of the bowel, increasing at the expense of the distal loop, whose fixation at the ileocaecal valve finally limits the process. Every volvulus, of course, does not achieve these dimensions; we find torsion of the bowel in various stages and frequently influenced by such extraneous conditions as adhesions, etc. This conception of volvulus is quite analogous to that of intussusception, whose "normal" occurrence may be taken as a frequent cause of colic in early life, and whose "abnormal" occurrence as the exaggerated condition brought about in certain instances of the normal by some such conditions as those mentioned above, viz, distention or intestinal stasis. In a sense, clinically, intussusception represents the irreducible fixation of the bowel in a position naturally assumed and usually spontaneously reduced.

Certain conditions predispose a loop of bowel to volvulus, and perhaps the chief of these is lengthening of the mesentery. If the mesentery, for some reason, is drawn out so as to permanently increase the distance between the bowel and the root of the mesentery, and if the lengthening occurs only in a given sector, the bowel immediately above and below this point will be drawn into relatively close proximity, thereby throwing that loop dependent upon this lengthened mesentery into a U shape. It is quite evident that such a loop, being hung on a long suspensory ligament of narrow base, is much more liable to torsion than is a normal one. Furthermore, if this sector of the mesentery be the subject of repeated minor traumata the resultant inflammation brings about fibrous thickening and loss of pliability, thus hindering spontaneous reduction of a twist.

In almost every case cited above, there has been a hernia

present for years; the lengthening and thickening of the mesentery of a loop of bowel which has occupied a hernia sac for years is a matter of daily recognition in the operating room. Almost every case cited above is well past middle life; intestinal stasis is probably the rule in advanced years. These facts make it evident that individuals of advanced years with a hernia of long standing offer conditions very favorable for the occurrence of volvulus.

The mechanism peculiar to the individual groups is interesting:

Group I: The point of torsion lies within or just above the sac.

We may imagine that the loop, which has been repeatedly extruded into the sac, has assumed within the abdomen a certain degree of torsion which is momentarily more or less fixed; by a sudden exertion, associated perhaps with the increasing distention of a partial intestinal obstruction produced by the twist itself, this loop is extruded while in torsion. Descent into the hernia sac increases the tension on the mesentery, circulatory changes and distention of the loop follow, rendering spontaneous untwisting more difficult, while constriction at the neck of the sac, if present, adds further hindrance. If, now, the tumefaction and distention dependent upon torsion of the mesentery increase steadily and the constriction at the neck of the sac be relatively great, that constriction will sooner or later occlude both blood-vessels and gut, producing "strangulation."

It is to be noted, however, that hernial strangulation is not inevitable, and that operation frequently compels the diagnosis of incarcerated rather than strangulated hernia. As opposed to this view, it has been suggested that the twisted position may be assumed in the hernia sac, being caused by violent peristalsis; while this cannot be definitely disproven it seems highly unlikely.

Group II: One loop of an intra-abdominal volvulus becomes herniated.

Here the mechanism seems clear. The first event is intra-

abdominal torsion, to which the loop usually herniated is so prone. Increasing distention and straining ultimately force a loop of the volvulus into the hernia sac. Depending upon the comparative values of the factors named above, viz., swelling and distention of the gut and constrictive action of the neck of the sac, the extruded loop may show no difference from the retained loops, may become incarcerated, or may become actually strangulated, the intra-abdominal loops of the volvulus remaining quite viable (Knaggs, Group II, Case 2). The lesion in Groups I and II is almost always of the ileum.

Group III: Volvulus proximal to actual strangulated hernia.

In this instance, the first event is intestinal occlusion brought about by strangulated hernia; proximal to this point distention increases and peristalsis becomes more violent, ultimately resulting in volvulus. It is to be noted in these cases that volvulus does not concern a loop whose mesentery has been altered by repeated descents into the hernia sac but rather a normal loop, so that we may picture the process as a clear-cut example of the transformation from potential to actual volvulus, brought about by interference with the intestinal current. Two of the five reported cases were obturator herniæ. Considering the frequency of strangulated hernia, it seems remarkable that the condition is not met oftener; it is highly probable that the infrequency is one of observation rather than of occurrence. More frequent post-mortem examinations in cases terminating fatally in spite of apparently satisfactory operation will add to the number of this group.

Group IV: Volvulus below an incarcerated hernia.

These cases seem to be exceedingly rare, for there are but three to be found in the accessible literature. In all of them there was a volvulus of the large intestine, twice producing stenosis in the neighborhood of the hepatic flexure and once at the sigmoid. In Rokitsky's case operation was not made so that autopsy revealed the actual conditions, and here we find stenosis at the hepatic flexure, above which there existed extreme distention. One loop of ileum occupied the hernia

sac, less distended than the rest of the small bowel but not strangulated. We may reasonably argue that volvulus of the large intestine was the first event as well as the cause of death, and that extrusion of the bowel into the hernia sac was merely an incident due to distention and muscular straining. There must have been a variation from the normal fixation of the cæcum, allowing a wide excursion of motion, and this may have been produced or increased by frequent descents of the cæcum into the hernia sac; if such were the case, the hernia is to be regarded as a factor contributing toward the establishment of volvulus. In Richet's case it is probable that similar conditions existed, though an apparently successful reduction by taxis obscures the interpretation of the autopsy findings. Dona's case is more complicated. Operative reduction of a sigmoid volvulus was followed by death on the eighth day from pulmonary œdema. Autopsy disclosed a high loop of the ileum occupying a right inguinal hernia but somewhat constricted within the abdomen by the untwisted sigmoid. The picture would seem to be that of primary sigmoid volvulus complicated by an unusual though purely secondary phenomenon. The similarity between these cases and Hochenegg's picture of "combination ileus" immediately suggests itself.

Group V: Volvulus immediately after reduction of a hernia.

Group VI: Volvulus long after reduction of a hernia.

The explanation of these groups is that of volvulus in general, though influenced in certain cases by the predisposition to torsion of a loop commonly herniated.

*Diagnosis.*—The condition has rarely been recognized before operation. A diagnosis of acute intestinal obstruction due to strangulated hernia has almost invariably been made, only to be disproven during the course of the operation, at a second operation, or perhaps most frequently at autopsy. In the face of so grave a lesion accurate diagnosis is essential to successful management.

Advanced age is the rule. The average age of the collected cases is over 52 years; if the case of hernia into the

umbilical cord be excluded, the average age is over 54 years. The average age of Group I is over 62 years and of Group II is 52 years.

With few exceptions the hernia is of long standing. The average duration is well over 19 years, and for Group I alone is 27 years.

The location of the hernia appears to be of little help. Inguinal rupture predominates, occurring more frequently on the right than the left side, while umbilical and femoral rupture appear occasionally and usually in women. Obturator hernia occurs twice in the collected cases, in each instance strangulated and associated with volvulus of an oral loop.

The ruptures are almost uniformly described as of unusually large size.

Twenty-four of the cases are male, twelve female; a fact of possible significance.

The typical case is, then, a man past 50 years of age, frequently past 60 years, with a large inguinal hernia of long standing, often more than 20 years.

Several of the features of the acute case are important though far from pathognomonic.

Shock is usually extreme, pallor, sweating, and the facies of great suffering and anxiety having been noted repeatedly. This feature in the writer's cases was very striking indeed, and should have led to suspicion.

Abdominal pain may be severe and in certain cases may be localized and associated with more or less marked tenderness. In one case (Dobson, Group II, Case 5), a mass was palpated, leading to a correct diagnosis. Locally there is increase in size of the hernia, but pain and tenderness, while usually present, may be strikingly slight.

This great disproportion between the degree of shock and the signs in the hernia, accompanied by marked abdominal symptoms, is characteristic.

Up to the present time volvulus has been almost invariably an unexpected operative finding. The number of disasters due to unsuspected volvulus justifies emphasis of the self-evident

fact that any operation for strangulated enterocele must clearly demonstrate that strangulation, viz., a constriction at the neck of the sac, a compression ring on both afferent and efferent loops, absolute delimitation by these compression rings of the area strangulated, a dilated oral and a collapsed aboral bowel. Disregard of this elementary rule has probably led to many unjustified fatalities. In the cases under discussion, several atypical conditions may be found. The constriction at the neck of the sac may be slight or even absent, and the bowel show but moderately marked compression rings and slight circulatory changes. The constriction at the neck of the sac may be well marked and the ensnared bowel cyanotic or even gangrenous, but the proximal loop above the hernia presents the same appearance. It may be impossible to bring the aboral bowel out of the abdomen for examination. A taut band or mass may be felt just above the ring. Both aboral and oral bowel may be distended (above a volvulus). Both oral and aboral bowel may be collapsed (below a volvulus); this is rarely seen, but has been found by Sick in one case. Bloody fluid may escape from the peritoneal cavity. The presence of these atypical features makes it at once evident that the hernia cannot be the cause of intestinal obstruction. Upon the recognition of any one of them, abdominal exploration becomes immediately indicated. With careful observation few cases should be overlooked.

The greatest difficulty will be offered by volvulus of a distant oral loop above an actually strangulated hernia; here the rupture will dominate the picture, a mechanically satisfactory operation will be made, and probably no suspicion will be aroused. A collapsed oral bowel immediately above a strangulated hernia should be significant, but its presence is probably not constant. Volvulus is itself dependent upon distention, and in most cases will follow rather than precede; in other words, the oral bowel will be distended before volvulus is brought about. Fortunately such cases seem relatively infrequent and when overlooked at the time of operation they will be saved only by a second exploration if at all.



## CONCLUSIONS.

1. Volvulus may produce in a hernia signs and symptoms which accurately simulate hernial strangulation; or it may be associated with actual strangulated hernia.
2. Volvulus, in either association, may readily escape recognition; it is probably contributing heavily to the mortality of strangulated hernia.
3. The diagnosis before operation is usually exceedingly difficult; there are, however, certain very suggestive features, viz., advanced age, the presence of a hernia for many years, shock out of proportion to the signs about the rupture, and marked abdominal pain and tenderness with occasionally a palpable mass.
4. The diagnosis at operation depends upon careful observation, there being certain signs which are pathognomonic; an operation undertaken for strangulated hernia must demonstrate absolutely the strangulation.
5. Volvulus proximal to actual strangulated hernia apparently offers no sure means of diagnosis other than routine abdominal exploration—a procedure which is manifestly not to be recommended.

## THE RESTORATION OF FECAL CONTINENCE AFTER ILIAC COLOSTOMY.\*

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To make an artificial anus is an operative intervention of such urgent necessity that the surgeon does not hesitate to propose it, and the patient, reduced to extremity, generally accepts it.

However, when the period of urgency is over, in both the patient and the operator a reaction takes place. The sick person, forgetting his past sufferings, begins to feel that he should prefer them to the miserable state to which he has now come, and the surgeon finds that the interesting case has developed into a troublesome one.

In such conditions, mind and sentiment work together to devise some relief for such misery; I add my attempt to the many already made.

Although the study is not yet illustrated by sufficient clinical matter (three cases only), I have already, with sufficient certainty, settled that the line of conduct I propose is devoid of dangers; it promises good success when it is employed in favorable cases, that is to say, those which can be radically cured.

Up to now I have, of course, limited myself to the so-called inoperable cases, which outlived the operation some months and remained cachectic and suffering, owing to the advanced condition of their initial disease and the pain, which were impossible to cure.

Hence, I could not ascertain whether the method would give the patient the desired help to enable him to attend to his

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every-day business and social duties in such a satisfactory way as I have the conviction should be the case in radically operated cancers or in such grave conditions as to legitimize such intervention.

The fundamental idea of the method I apply consists in causing the proximal end of resection of the intestine opportunely mobilized to cross a subcutaneous tunnel, which is parallel to the exterior border of the rectus muscle, in such a way that a simple belt (that of the drawers, for instance), going round the trunk and passing over the iliac wings, should play the part of an effectual and comfortable band of compression on the intestinal segment running between skin and aponeurosis (see Fig. 3).

Such a compression may be rendered more active by a contraction of the abdominal wall, in the moments in which the individual feels the need of it, *e.g.*, in diarrhœic attacks and during active peristalsis of the colon. Theoretically its function would thus imitate well enough the natural function of the sphincters.

In the application, two other factors work together, which are not only favorable to the common purpose but also prevent the prolapse of the mucosa. These factors are:

I. The two angular deviations which the intestine undergoes, the one on account of its being carried into the subcutaneous tunnel, the other because it has to run through it.

II. The diminished vivacity of the peristaltic movements of the terminal segment, which is due to its adhesions with the abdominal wall.

I have already had the opportunity of determining the power of these two factors in the first case in which I ventured only to cause a short subcutaneous distance to be travelled over.

The direction of the line of travel may be from top to bottom or *vice versa*, according to the intestine it has to pass over and according to its relations with the wall and the length of the mesentery.

In my operations, I made it a rule to avoid any torsions and flexions superior to the right corner, as well as to prevent

the mesentery from stretching, preferring rather to cut it as far as it was necessary (see second case).

In order to conform myself to these rules, if then the subcutaneous segment must be a part of the sigmoid or of the ascending colon, it will generally be convenient to give it an ascending run (third case); if, on the contrary, it has to be the descending colon, it will be convenient to give it a descending run (second case).

In the first case, very good results could have been obtained by a complete ascending run, but as it was the first attempt, I did not risk a long subcutaneous run but studied rather to get a favorable position for the application of an effectual compressor.

These considerations over, I sum up the technic obtained from the study of the three clinical cases annexed to this work, bearing in mind the frequency of cancer of the rectal ampulla.

#### TECHNIC (MESIAL LAPAROTOMY).

If we admit the most ordinary case, that of the possible radically operable cancer of the rectum, in which the sigmoid and the mesosigmoid are intact, one can proceed as follows:

STEP I: Having gotten hold of the sigmoid and ascertained the upper limit of the tumor, apply at some distance from the latter a first occlusory\* (compression clamp), going across the mesosigmoid from right to left with the blade, which has the

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\* These occlusories are clamps with grooved blades, one of which has an opening at the point and the other one a corresponding tooth. These clamps have an homogeneous and firm hold, which does not injure the serosa, reduce into sheets the muscular walls, nor cut the mucosa at the level of the two ribs of the groove.

The muscular walls which spread themselves into the groove constitute an effectual barrier, which also opposes itself to the escaping of the grasped organ should a resection be made very near the clamps.

The resection being made, the extremity of the intestine is imprisoned in the double groove, and one can only see between the blades that the line of resection of the serosa and the muscular is joined together, even after the removal of the clamps, hence the name of occlusory.

Similar occlusories which have a rack with three teeth, shut at the second one, are successfully used as simple compressors, over which latter they have some valuable advantages (see Bibliography<sup>1</sup>).

opening, and shutting it in such a way that the adherent margin and the free one should fall not at the extremity, but in the middle of the compression so as to better control the hæmostasis (see Fig. 1).

When the mesosigmoid is much infiltrated, as happened in the second case, this application is a little more delicate, but it succeeds well owing to the propinquity of the point with the opening, which is able to follow the guidance of the touch, exactly in the same way as a channelled probe.

STEP 2: Mobilize a long section, about eight inches, of the sigmoid's upper portion and cut off a certain length of the mesosigmoid, as much as is necessary. Such a resection must be made at a certain distance from the adherent margin, in order to avoid the terminal vasal branches. Instead, in the above-mentioned second case the mobilization must be done by cutting off near the margin.

The last one or two inches must be brought out through the skin, to be temporarily used to establish a union with a rubber tube; and as they are to be eliminated little by little in a few days, it is not necessary to trouble about their means of nutrition.

STEP 3: An incision of about two inches along the outer margin of the left rectus muscle is made, the upper extremity of which does not go farther than the height of the horizontal line passing between the two upper anterior iliac spines (see Fig. 1).

This incision, which is parallel to that of the mesial laparotomy, involves, like this one, all the thickness of the wall, and it is rendered rapid and sure by taking hold, in the left hand, of the left margin of the laparotomy cut, in such a way as to take in all the breadth of the rectus muscle and to put the pulps of the four fingers in correspondence with the line of the cut of the peritoneum. As soon as the bistoury has entered the parietal peritoneum, the thumb, from the outside, and the ends of the other fingers, from the inside, occupy the hole thus created, and keep it gaping ready to let a second clamp be introduced. By opening this second clamp, a dilatation of the incision is obtained as large as is necessary by simple expansion with the fingers or obtuse instruments. Joining the skin to the border of the peritoneum with two stitches, one does away with the remote danger, that a little blood might get in the cavity, and afterwards avoids wasting time in searching for these borders which are to be joined to the intestine.

STEP 4: With the above-mentioned second clamp, the handles of which are at the exterior of the cut and the holding blades at the interior, the sigmoid is seized at about one-half centimetre above and parallel to the first clamp, going from left to right in the same opening which is already created in the mesosigmoid (see Fig. 1).

To prevent intestinal contents from remaining in the short segment of the intestine, it is taken away by pressing with the finger or with the second clamp itself; also a gauze is passed through the enlarged eye of the mesosigmoid, in order to protect the posterior wall of the sigmoid lying between the two occluding clamps.

STEP 5: The operator gives to the second clamp a torsion of  $45^\circ$  (see Fig. 1), to better expose the free margin of the gut included between the two occluding clamps; with a Paquelin cautery in the neighborhood of the second clamp, he penetrates the intestinal lumen and sterilizes with heat the mucosa and the very scanty intestinal contents, which may still remain after the above-mentioned pressure.

When the cauterization is finished, the resection is better completed with the bistoury, in order to proceed more quickly and to obviate the danger of burning the underlying gauze.

The resection is done near the second clamp; this whole act might be accomplished with the bistoury, with which an opening could be made in the same way as with the Paquelin, through which one would disinfect the intestinal cavity with a strong disinfectant.

For my patients, I used the Paquelin, which I think is safest, though I own that it requires a little more time and attention. These extreme precautions are justified by the ulterior treatment of the two intestinal extremities.

STEP 6: For the moment, the lower extremity is abandoned on the operative field, without being obliged to worry about protecting it with gauze if it has been cauterized; the upper extremity is at once extracted through the lateral incision by making traction with the second clamp by which it is held. The passing through is rendered easy by the fact that, the intestine being cut close to the clamp, the free, smooth surface of this latter may be pressed with force against one of the walls of the incision, thus rendering the way gaping and free.

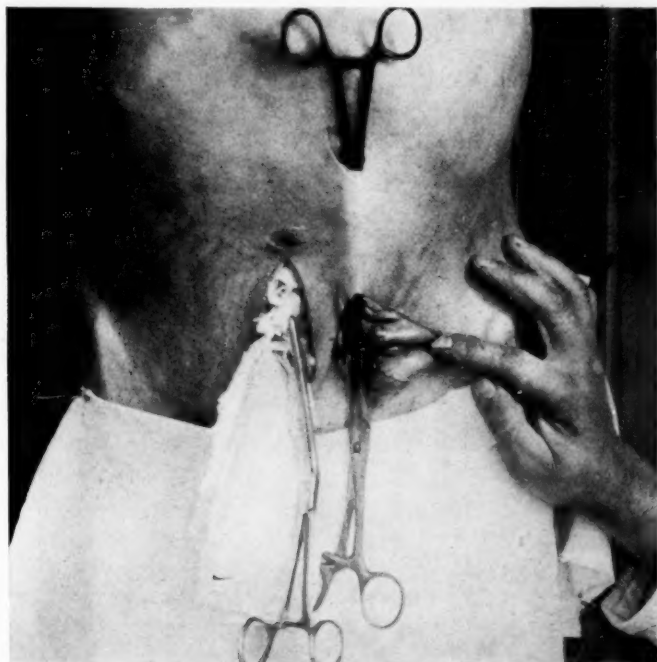


FIG. 1.



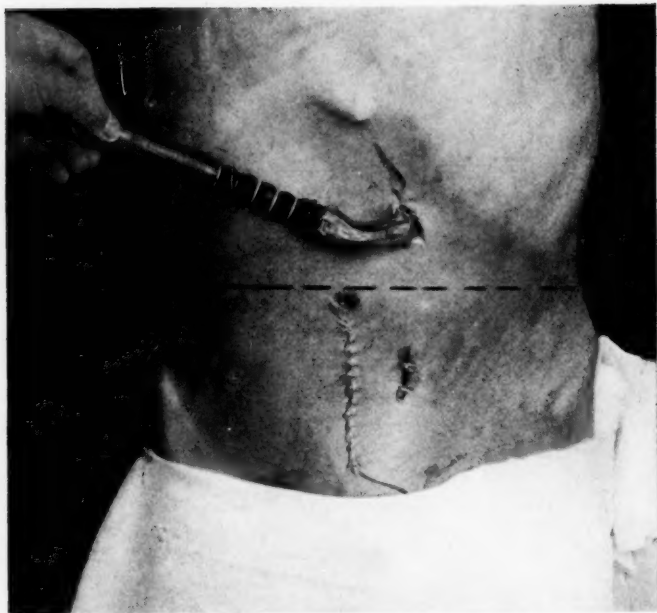
Showing mesial laparotomy, loop of sigmoid brought out, divided between two clamps; proximal end about to be drawn through opening through left rectus below level of the iliac crests.

FIG. 2.



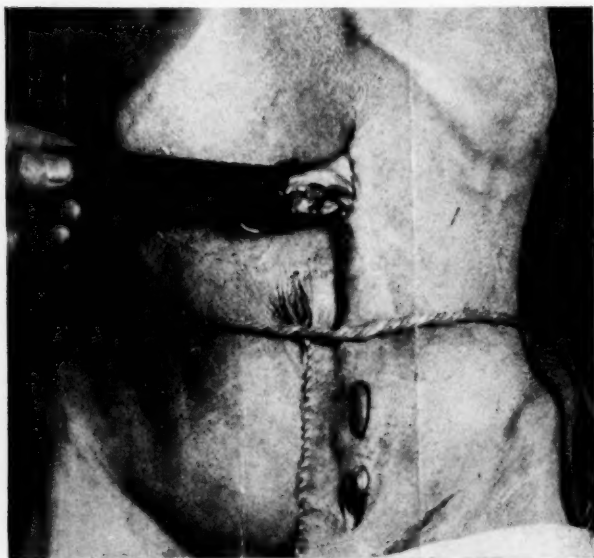
Proximal end of gut drawn through lateral incision, subcutaneous tunnel superficial to rectus muscle made, clamp inserted along tunnel ready to draw free segment of intestine into it and out at the upper opening of tunnel.

FIG. 3.



End of intestine projecting through upper lateral opening; rubber tube fastened into its lumen for fecal drainage; primary laparotomy wound closed. Transverse dotted line shows level of iliac crests.

FIG. 4.



Showing conditions produced in Case I.

Remove all the mobilized portion of the sigmoid through the lateral incision, taking care that the exit from the abdomen shall be produced without torsions of the intestine and without tension of the mesentery, which now occupies the lower angle of the incision itself.

STEP 7: Over the upper part of the abdominal rectus muscle, a second cut of two inches is made, which, differing from the first, is made only in the skin and in an obtuse manner. By pushing a third shut clamp through the subcutaneous connective-tissue plane, a subcutaneous tunnel is created along the exterior border of the rectus muscle, as far as the lower incision through which the sigmoid emerges.

By opening the clamp a little, the tunnel is dilated as much as is necessary to create a convenient way for the sigmoid. This dilatation should be made rather at the expense of the outer wall of the tunnel, in order to keep it well isolated from the laparotomy cut.

STEP 8: When the tunnel is established, the point of the second clamp by which the sigmoid is held is inserted in the lower extremity of the tunnel between the half-open point of the third clamp; with this latter the sigmoid is grasped in the neighborhood of the second clamp.

By exerting a light traction on the third and by pushing on the second clamp, it is easy to cause the sigmoid to run along the tunnel, and to make it come out from the upper skin incision with a length varying from  $1\frac{1}{2}$  to 3 inches, according to the greater or the smaller mobilization of the segment of the intestine (see Fig. 2).

In order to obtain such a result, it is of course necessary to take the second clamp out from the tunnel; to effect this it is sufficient only to open it a little and draw it from the lower incision. As a rule, the extreme part of resection already grasped by the above said clamp remains closed. In any case, in order to protect against infection, it is expedient to cauterize the short extent of the mucosa, now protruding beyond the third clamp. This third clamp may be left in place for a time (about 24 hours) or, if it is desired to maintain the free passage of the anus, it may be substituted by a rubber tube (see Fig. 3).

I followed the first method in the first case, the second in the others, and I find this latter preferable, especially as asepsis of

the operative field is easily maintained, owing to the large sized rubber tubes, furnished with many circular external depressed grooves, which I have proposed and adopted in rectal operations (cancer and hemorrhoids<sup>1 2</sup>).

These rubber tubes have some advantages over those of Paul. Only about a third of an inch of the intestinal tube is used for a fixation; the first fixation is kept valid for three days, and the successive ones for two days, in such a way that with exception of about two inches of sigmoid, coming out from the upper incision, one can maintain an aseptic condition for all the time necessary to the healing.

STEP 9: The skin corresponding to the first incision is sutured after having fixed the parietal peritoneum with some stitches to the intestine emerging from the abdomen. With more stitches, the skin of the second cut is fixed to the base of the intestinal part which protrudes from the tunnel. The lower extremity of intestine may be closed and dropped in or may also protrude at the lower angle of the laparotomy cut.

In order to save time, the second practice is better, but as a rule, according to my own experience, I advise the former.

To put the lower intestine in the abdomen, pass a suture through the whole thickness of the cauterized walls, jutting out from the clamp; then, two sustaining laces are applied below the clamp, one on the free margin, the other on the adherent one; in the latter is included also the line of resection of the mesentery in order to establish the necessary hæmostasis. Then the clamp is taken away, and a burying suture going from one to the other of the two sustaining points is applied.

The compressing grooves of the clamp help the burial of the line of resection.

The laparotomy gap is shut by layers. If there is any fear of the asepsis not being perfect it is better to use wire stitches in the shape of an 8. The use of these stitches renders also superfluous the definitive hæmostasis of the margins of the wounds. Such easily removable stitches involve the skin in the superficial loop, and in the deep serous membrane and the aponeurosis, or only the aponeurosis if, as I find preferable, the serous layer is sutured apart. In order to ward off the danger of impregnating the lines of suture, endeavor to isolate them from the general treatment by covering them over, for instance, with a bismuth and sublimate paste.

As will be seen from the clinical notes, the described routine may be deviated from, according to the various circumstances which might occur in an unforeseen condition. The essential deviations refer to the successions of the steps of the operation and to the number of the changes of the clamps. Such changes, being easy and quick, must not be spared if the conditions render them advisable.

Thus, for instance, in the second case, the diffused infiltration and contraction of the mesosigmoid would have rendered the intestinal mobilization much more difficult, if it had not been preceded by the resection of the intestine between two of the clamps.

In such cases, the section of the intestine is made midway between two clamps, put about a half inch one from the other.

Of course the mentioned case was an exceptional one, for which it would not have been appropriate to apply such an operation, which should be reserved to radically curable cases or at least when there are no conditions which absolutely exclude such presumption.

#### REPORTS OF CASES.

CASE I.—A. M., forty-three years old, gardener. A healthy, robust man. Rectal carcinoma; artificial anus, June 4, 1908. At about two inches from the anal opening, a tumor was felt projecting into the rectal ampulla, with smooth, irregular, globular surface and of a flabby consistency; it was impossible to reach the upper limit of the tumor, but one could see that it was fixed to the promontory. In the left iliac fossa was to be felt an ovoid mass, and in the groins small, hard glands.

Laparotomy below the umbilicus under lumbar anæsthesia.

The tumor, which occupied the last portion of the sigmoid, had a large base fixed behind. There were numerous infiltrated glands. It was judged inoperable. Between two clamps, a section was made at the upper limit of the sigmoid loop in such a way as to cause the distal cut end to protrude from the lower angle of the laparotomy wound. The upper extremity was treated according to the general technic already described, diverging only for the places of the two openings of emergence as can be seen in Fig. 4.

I succeeded in performing this aseptically, owing to the following method: When the third clamp was passed through the counteropening and through the subcutaneous tunnel, I grasped the intestine below the second clamp, which latter I took away, cauterizing the jutting stump and drawing out the third clamp. I then caused the intestine to run through the above-mentioned tunnel. I closed the first iliac cut with grapples and with a few serous cutaneous stitches I fixed the intestine at the second lower cut.

In this way, one gets a segment of intestine of about three inches, situated between skin and underlying aponeurotic muscular wall (Fig. 4).

Into the jutting part of the intestine was fixed a large rubber tube, which carried the fæces beyond the aseptic bandage. To better ensure its asepsis, the median laparotomy wound, at the lower corner of which the distal cut end of the intestine (kept closed by the clamp) was fixed, was first closed with some serous cutaneous stitches.

*Post-operative Course.*—For some days, apyretic. From the new canalized anus, gas and fæces exuded freely; from the old one, the expulsion of blood and mucus continued.

After three days, I fastened the intestine on the rubber at a distance of a half inch from the first ligature, which was to be cut.

The patient had no hiccoughs nor inclination to vomit. The whole of the operative field healed *per primam*. The stitches and the clamp were removed on the sixth day.

Afterwards, elevations of temperature appeared as well as frequent attempts, so intense as to prevent sleep, to emit secretions from the excluded intestinal portion.

It was not possible to wash the excluded intestine from the abdominal mouth towards the anus, and it was also impossible to pass an elastic probe through it.

As the excluded intestine protruded an inch from the level of the abdominal wall and was much inflamed, a resection was made, by applying a clamp at the point protruding, in such a way as to make possible washings of the anus with high pressure, without running the risk of infecting the fresh scars.

After this treatment I had the satisfaction of seeing the high temperature fall as if it depended on inflammation propagated to



the excluded intestine, which was the seat of the ulcerated tumor.

The painful calls of nature continued, which was the only disturbance the patient had. This disturbance, however, was so grave that I regretted not having taken away the diseased portion of the intestine, even if it had been impossible to take away also the adjacent infiltrated tissues. The patient declined in the hospital and at home. Before sending him home, I had an aluminum shell made (kidney shape), perforated with holes, of which the two concave extremities covered the two intestinal mouths and protected them from the clothes rubbing them; the convex mesial part of the shell was suited to exercise a pressure on the intestinal segment which passed under the skin, thus assisting the retention.

Ten weeks later the patient was found much wasted and pale. The artificial anus operated regularly.

The patient, who was a little constipated and remained in bed, had no need of the apparatus, answered the call of nature once a day, sometimes with the help of clysters.

From the two intestinal mouths, mucus was passing; but the neighboring skin was perfectly normal, especially that of the anus where the mucosa protruded about half an inch, not caused by prolapse but because a little segment was left jutting out (Fig. 4).

In the space of intestine which runs under the skin, hard balls were found.

The calls of nature continued, and were combated by an injection of morphia every other day. Of course their intensity was diminished because the canalization of the tumor section had improved, as the liquids now easily passed from bottom to top, so much so that by elevating the irrigator a little they gushed from the abdominal opening.

By introducing a finger into the abdominal opening, the tumor was felt at the depth of about two inches, so it was evident that it had spread towards the top; and by introducing a finger into the anus, the tumor also was felt at a depth of two inches, that is to say, a little lower. Patient died four weeks later.

The experience in this case dictated the general technic which precedes this case report.

Having seen the inconvenience of the abdominal fixation

of the lower intestine, and having recognized the advantages of it only theoretically, my advice is to renounce it, as I did in the second and third cases.

The aluminum shell is not necessary if the subcutaneous tunnel is made between the iliac wing and the costal arch, where the pressure of the clothes usually falls.

This is so much the more evident because the patients, who are kept a little constipated, do not need a permanent retention. I think the merit of this is due to the two angular deviations undergone by the intestine. Only in the diarrhœic state or with profuse flatulence the need of a mechanical help to the retention may be necessary, and then, the patient, stiffening the muscles against the belt of the clothes, might so obtain the effect of a sphincteric contraction.

CASE II.—A. T., fifty-eight years old.

Suffering from ulcerated cancer of the rectal ampulla, which had greatly invaded the superior part. There were present numerous metastases of the iliac and bilateral inguinal glands.

*Operation*, March 31, 1909, under spinal anæsthesia, good for 45 minutes. Median laparotomy. The abdominal cavity contained liquid slightly tinged with blood, the peritoneum was thickened, the bladder was forced higher by the rectal tumor. The mesosigmoid was nearly annulled by neoplastic coarctation and infiltration. Numerous mesenteric glands were swollen.

The sigmoid loop was cut between two clamps. About eight inches of intestine were isolated from the mesosigmoid and mesocolon, from necessity keeping close to the intestine itself. The lower extremity was closed with sutures involving the whole thickness of the intestinal wall standing out from the clamp. Afterwards the clamp was taken away and a seroserosa suture made without making a true introflexion, owing to the restlessness of the patient.

To avoid the danger of compromising the nutrition of the intestine and to avoid giving pain to the patient, I renounced making a later severance of the mesosigmoid, which would have been necessary to enable the colon to protrude at the level of the costal arch. Instead, I made a buttonhole at the external border of the left rectus muscle at the height of the umbilicus, from which

the intestine was made to protrude, pulling it through with the first clamp and grasping it at the outside with a second one. The colon appeared so deviated at right angles that, lest the mesocolon should undergo a harmful traction, the buttonhole was prolonged somewhat at the base, closing the upper angle with two stitches in the shape of an 8 after having fixed the peritoneum to the colon itself.

With a few stitches of silk the skin was brought against the colon protruding at the side.

*Post-operative Course.*—Most regular. In the first day a few fæces passed spontaneously from the colon. For two days hypodermoclysis was used. The pulse was regular: highest frequency 88. During the second day, the first contractions of the small intestine were slightly painful, which pains soon vanished, and in the following days regular expulsions with borborygmi occurred. At the end of the third day the patient was given magnesia lemonade. The tongue remained dry till the fifth day, showing how slight was the resistance of the cachectic and unfed patient. On the fourth day the hooks were taken off and the lace on the colon was changed, without succeeding, however, in squeezing it forcibly enough on the rubber, owing to the infiltration of the walls.

On the sixth day the constriction of the lace gave way and the dressing was soiled a little; it was changed and the two stitches of silk were removed. The two wounds were not at all red. The intestinal tube was changed by a caoutchouc involucre which did not hold perfectly. I therefore had an ordinary ice bag prepared, the neck of which was attached to a fixable band to go round the patient's body. By passing the intestine into the bag, it nearly stopped up the neck of it and when the patient was on his left side or in a standing position, the retention of the fæces was satisfactorily assured. Thus, I could allow the patient to get up on the seventh day; after half an hour he had to lie down on account of great weakness, although he had had an injection of camphor oil. During the night, the bag emptied itself on the bandage, soiling it completely.

Eleventh day: The protruding colon was clean; complying with the patient's will, I decided to leave it permanently.

Fifteenth day: General aspect improved. He walked alone, and could sit easily; the perineal pains had become regularly

less from the day of the operation, evidently because the irritating action of the fæces and the frequent contractions had ceased.

The emission of the fæces was sufficiently well regulated by the use of small doses of opium and bismuth; the patient must even at certain intervals use enemata to avoid obstruction.

REMARKS.—The operation much relieved the pains, and life was prolonged till August, that is to say, at least four months longer because the intervention was asked for when the patient was convinced he could not exist without it.

However, the inconvenience of being obliged to carry the bag, the necessity of a careful cleansing of the part to avoid inflammation, and also the use of the clysters presented to the patient, poor peasant, so many elements of discomfort that they greatly lessened the benefit of the above-mentioned advantages.

For these poor people this operation would be clearly indicated, if at the permanent continent anus, which I propose in this work of mine, it were still possible to join with it the radical removal of the rectum.

As seen from this very case, a grave operation can also be very well supported (when one scrupulously applies the rules of a good technic, which saves one from accidental complications) even in a cancerous cachectic, weakened by a prolonged lack of nutrition. If, then, it is a question of operating on individuals who are still radically operable, it is not the duration of half an hour more or less which will influence in the choice of our intervention. When the patients and relations are advised of the gravity of the operation, it is better to face the greater danger of an immediate failure than to expose oneself to painful complaints after a short interval.

A scientific result worthy of consideration, furnished by this case, is the control on the strength of the parietal circulation in the sigmoid and inferior portion of the descending colon.

Notwithstanding the excision of the mesentery, a segment of more than six inches was kept perfectly nourished. In a continent anus, typically made, one can deduce that the passing through tissues normally vascularized would favor the nutrition

of the mobilized segment, but in this particular case this factor was missing for the two-thirds which protruded uncovered from the abdominal wall.

In spite of this, the idea of re-covering the stump with Thiersch's skin grafts had been entertained, as the condition was so encouraging and the beginning of a regular extension of epithelium from the cutaneous margins was evident.

CASE III.—F. T., forty-six years old.

Woman of robust constitution, but now cachectic. Tumor of the rectum distant about three inches from the anus, its lower limit embracing all the perimeter of the rectum, obliterating nearly all the lumen; tumor fixed to promontory.

*Operation*, May 15, 1909, ether narcosis. Median skin incision displaced laterally along the external margin of the left rectus muscle so as to avoid a special lateral incision of the wall for the emergence of the sigmoid.

A tumor the size of an orange occupied the terminal portion of the sigmoid and the beginning of the rectum, and was firmly fixed to the sacrum. In this case it was necessary to treat the upper extremity as in the first case, that is, carrying the resection of the mesosigmoid beyond the vascular arcades near to the adherent margin, since in this case the infiltration and shortening of the mesosigmoid, found in the second case, was not present.

Thus the mobilization of a space of about six inches in length was obtained. The lower extremity, on the contrary, sank down in the same way as had been done in the second case, with satisfactory results.

The only deviation from the technic necessary was due to the fact that the laparotomy, having been made sidewise to the rectus, it was necessary to bring out the sigmoid so that it remained at the lower angle of the cut, three-quarters closed by disconnected stitches. Thus, the advantages of the independent buttonhole already described were lost, and, in fact, the post-operative course during the first days was much less brilliant because there was a little obstruction owing to the squeezing provoked by the suture, which rendered the upper side of the incision narrow and rigid. The stagnation of the excrements provoked their condensation; thus, they could not freely emerge until the rubber tube (on which

the sigmoid's extremity was tied to better protect the cutaneous lateral incision from which it protruded) was taken away.

This disturbance was, however, quite transitory and afterwards the anus operated very well.

The belt of the clothes could produce such efficient compression on the segment of intestine which ran subcutaneously that there was every reason to expect that the continency could have been permanently secured. Unfortunately it was not possible to continue the observation, as the general serious condition of the patient caused her sudden departure from the clinic. She died eight months later.

REMARKS.—The point of emergence of the sigmoid through the abdominal incision was undesirable. More time was lost in dissecting the cutaneous border than in creating a separate buttonhole; the vitality of the tissues was more compromised; along the segment of intestine numerous laces and stitches of suture were placed, and, what is more serious, there was the risk of closing the laparotomy incision too little or too much. In the first case there would be subsequent hernia; in the second compression of the intestinal segment, which can only provoke a certain obstruction, as was the case in this patient. In fact, if it is easy and sure to regulate the amplitude of a separate incision, it is difficult to calculate how much a suture constricts an opening, as the constriction depends not only on the distance of the stitches, limiting the desired buttonhole, but also on the thickness and the width of the margins taken by the stitches and on the manner of closing the same.

Another lesson may be derived from this case: it is the necessity of removing the rubber tube from the extremity of the artificial anus when the excrements are formed, as the narrowness and rigidity of the tube tend to obstruct their exit.

Summarizing the experiences derived from the three mentioned cases: Following the explained technic, the operation is easy, quick, and safe. Each patient bore it in the best manner, and the local cure was most perfect.

The two bends of the intestine successfully assist to cause



the retention; and the adhesions formed with the abdominal walls, besides diminishing the peristalsis, must also directly contribute to fix the mucosa. The fact is that after four months in the first case the flabbiness of the mucosa was altogether missing, the neighboring skin being normal.

Whether the compression on the segment of intestine, placed between skin and aponeurosis, would be adequate to answer the requirements of the social life of the individual could not very well be determined in these three poor unfortunate persons, who, exhausted by their malignant disease, could not work again. They, for the greater part of the time, kept to their beds; and since they had a sufficient retention to make their condition tolerable, they avoided the discomfort of having the abdomen pressed by a band.

The second case represents a new and interesting contribution to the ideas which have already been gathered in clinical and experimental studies on the vitality of the intestinal tube after it has been more or less extensively deprived of the mesenteric insertion.

In the typical application of this method of mine, the intestine is literally involved in the subcutaneous cellular tissue, and naturally this last condition is favorable to the vitality of the loop, sufficiently so to save the operator any fear of the dangers inherent to the abandonment of the loop in the peritoneal cavity.

It is better to bring out the intestine through a particular buttonhole. Thus time is gained, although this does not seem to be the case; the segment is put between little injured tissues, the laparotomy cut can be well closed with stitches which remain isolated from the space occupied by the subcutaneous segment, avoiding with the greatest probability their operative or post-operative soiling.

If the patient is well purged beforehand and has no serious obstructive disturbances, in order to better guarantee the asepsis the clamp used to make the tunnel can be left on for 24 or 48 hours. I have been able in other resections of the rectum to allow it to remain three days without notice-

able inconvenience; but, on the contrary, in these three cases, in which it was necessary to have the alvus free as soon as possible, the asepsis was protected by tying the extremity of the segment on a rubber tube, reinforced by a tube of glass or metal, thus being able to improvise an excellent conductor of the excrements out of the antiseptic bandage.

It is, however, necessary to keep in mind the possible obstruction which may arise from the blocking of the rubber tube by formed fæces, which exceptionally happened in the third case. The lace which fixes the intestine to the tube cut the intestine after three days, and it was necessary to replace it with another at about one inch distance, hence the necessity of keeping the intestine protruding about two inches from the cutaneous buttonhole.

With regard to the treatment of the lower bowel end, I think its sinking preferable, owing to some observations made, which I shall sum up briefly: In the first case, with the idea of being able afterwards to alleviate the pain and favorably modify the ulceration with simple or medicinal washings, I had fixed such extremity to the lower angle of the laparotomy wound, using for this purpose the same clamp applied for the resection, and which, simply placed on the external dressing, ensured its fixation and retention for a period sufficient to the healing. The post-operative condition was excellent and regular till the sixth day. However, when the clamp came away, a high temperature appeared, as well as frequent desires to emit the secretions of the excluded intestine, and these were so strong as to prevent the patient from sleeping. It was not possible to get a lavage from top to bottom, and as I did not want to do it from bottom to top, for fear of soiling the recent scar, I decided to close this mouth and to perform boric washings through the anus. The fever fell, but the patient went on declining rapidly as if the tumor were excited to rapid increase in size.

I had the impression that the fixation of the stump in the abdominal wound had an influence on these facts, and the observation that they were missing in the two other cases in

which the lower extremity was sunk would indirectly confirm it.

In these cases, in order to guarantee the asepsis in which a fecal soiling of the dressing can at any moment arise, as in fact happened on the fifth day of the second case, I always protected the suture lines with bismuth and sublimate paste and to this I attribute the merit of the full success.

#### BIBLIOGRAPHY.

- Marro: Automatische und graduelle Festklemmung der Spitzen bei hämostatischen Fangen Histotritoren, Darmkompressoren und Okklusoren, *Deutschen Zeitschrift. für Chir.*, 1910, iv, Jun.
- Marro: L'Esportazione radicale delle emorroidi, *Tipografia Subalpina, Marino*, 1910.
- Lauz: Experimenteller Ersatz des Mesenterium, *Zentralbl. für Chir.*, June 1, 1907.
- Scudder: *Boston Med. and Surg. Jour.*, 1908, cliv, 338.
- Frank E. Bunts: The Separation of the Colon from its Mesentery, A Clinical and Experimental Study, *ANNALS OF SURGERY*, June, 1909.
- Marro: Communication to the Royal Medical Association of Turin, March 20, 1903; Un nuovo metodo di entero anastomosi. Nel volume scritti medici pubblicato in onore di Camillo Bozzolo, *Unione Tipografica, editrice Torino*, 1904.
- Roux: *Semaine Medical*, 1907.

# TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, November 9, 1910.*

The President, DR. ELLSWORTH ELIOT, JR., in the Chair.

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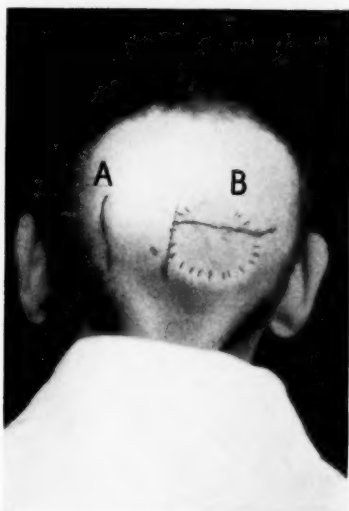
## TRAUMATIC MENINGOCELE.

DR. IRVING S. HAYNES presented a schoolboy, 14 years old, who was admitted to the Harlem Hospital with an injury to his head. His previous history was not obtained until the patient had been operated upon and some cause sought for the conditions then disclosed.

As a child, the boy had measles and whooping-cough, but was well up to December 24, 1900, when he fell two stories, striking upon the back of his head. He was brought to the Harlem Hospital in an unconscious condition. He made a rapid recovery, and was discharged as cured on January 5, 1901. No further details regarding this accident could be obtained from the hospital records, which at that time were kept in a very imperfect manner. The only results noticed by the parents were that he developed a squint, which was relieved by glasses, and that he stammered somewhat in his speech, which he had not done previous to the injury. With these exceptions, the boy, so far as they could determine, was as bright and forward at home and at school as any other child of his age. There was no history of convulsions, but now and then a slight headache. Since the fall, there had been a swelling over the back of the head.

Present history: On September 25, 1910, the boy fell from a street car in motion, striking on the back of his head and sustaining a small scalp wound. When seen by the ambulance surgeon he was semiconscious, but had fully recovered his senses by the time the ward was reached. Upon examination, he was rational, but complained of chilly sensations. There was a small vertical scalp wound, three-quarters of an inch long, located half an inch to the left of the median line and on a level with the

FIG. 1.

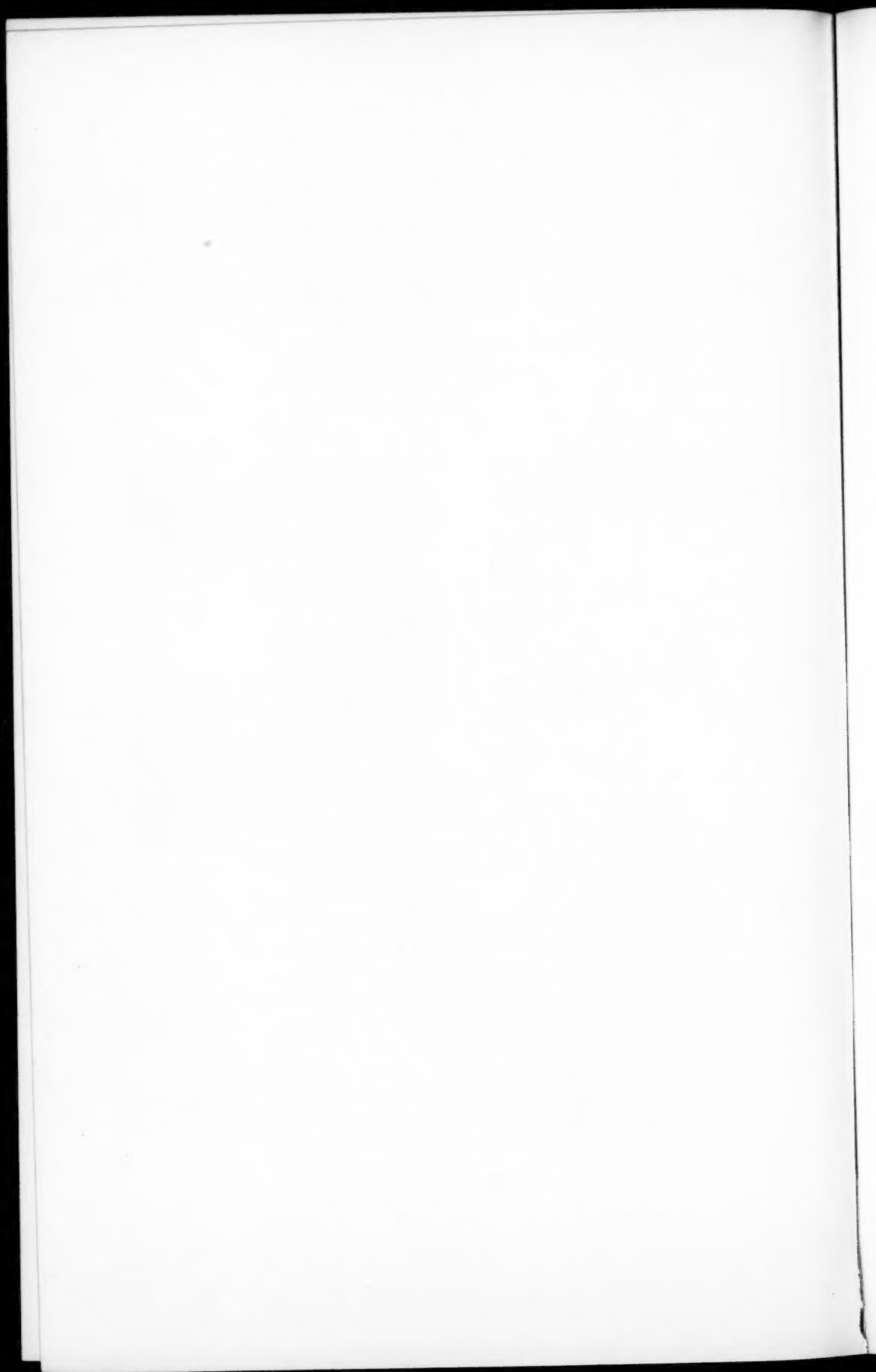


A, recent scalp wound; B, operative wound and site of first injury.

FIG. 2.



Shows depression of scalp into defect in skull when patient is upright; when he lies down, the surface is level with the rest of the scalp.





external auditory meatus (Fig. 1). This wound was sutured; it healed by primary union, and did not figure in the further history of the case. All the other organs were normal; the pulse was irregular in rhythm but not in force.

On September 27 the patient complained of a dull headache in the frontal region, and showed some signs of cerebral pressure. Temperature, 99.5; his pulse ranged between 66 and 90; respirations, 22. On the following day he was nauseated at times, and complained of pain in the region of the wound. The symptoms of intracranial pressure became more marked. The temperature

FIG. 3.

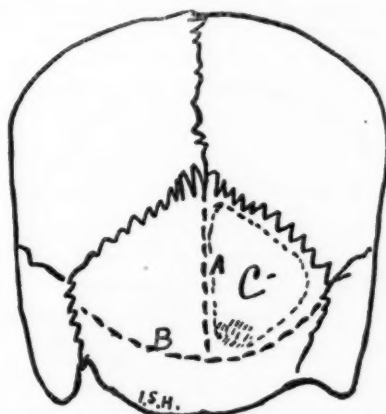


Diagram to indicate the position of the interoccipital (A) and transverse occipital (B) fissures, and loose piece of bone (C) found almost entirely detached at operation. Shaded area indicates only point at which pericranium was adherent. Dotted line, approximately size of piece with reference to skull.

ranged from 99 to 100; pulse, 60; respirations, 20. On the following morning his pulse was 54; temperature, 99; respirations, 24. The small scalp wound had firmly healed, and there was nothing abnormal about it. Over a corresponding area on the opposite side of the head the following conditions were noted: A section of the scalp about three inches in diameter was raised as if by a hæmatoma, and the region felt œdematous. In the centre of this area was a loose piece of bone, so free that it could be tipped up or rocked under the fingers in all directions. This œdematous area pulsated and bulged prominently. No crepitus was elicited upon moving the bone fragment. There was no apparent connection between this loose bone and the surrounding œdema and the recent injury. Dr. Haynes said that as he did not

at the time have the full history of the patient, he could not explain the condition and did not attempt to do so.

Operation: A vertical incision two inches long over the inner edge of the movable segment of bone gave exit to the usual scalp bleeding, and also to a gush of a very watery fluid, which, as the bleeding was controlled, became clear, but with a faint yellowish tint. The fluid flowed more forcibly at each pulsation of the heart. It was estimated that about six ounces of fluid escaped, but its loss was not attended by any perceptible changes in the heart's action or of the respiratory rhythm.

From the middle of the first incision, a second cut, two inches long towards the right, disclosed a portion of bone free from

FIG. 4.

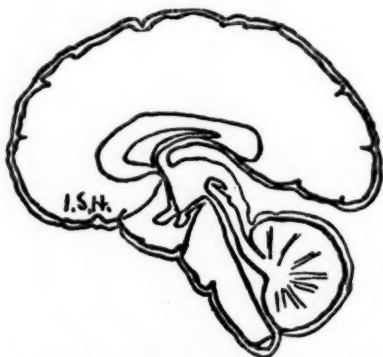


Diagram showing the formation of the velum (Gray, p. 947). This also shows the *potentia subdural space*.

any pericranial attachment excepting for an area of about a quarter of an inch at its lower inner margin. When this was severed, the bone was picked up and removed, there being no dura beneath it attached to it or visible. The removal of this section of bone revealed a large cavity whose greatest dimensions were about an inch from the surface, where the space showed a triangular shape, with sides about two inches in width and with the corners rounded off. The cavity thus triangular on cross section was pyramidal in the opposite direction, with base at the surface and the apex narrowing forward to an orifice about three-fourths of an inch in diameter at a depth of two and a half inches from the surface. The cavity of the cyst did not end here, but its direction changed to a more upward course. With the probe, this extension was about an inch in its vertical measure-

ment and half that distance transversely. The probe was stopped four and a half or five inches from the surface.

A careful study of the cavity showed that the dura did not come within a quarter of an inch of the margin of the bone at any point. The margin of the bone in the skull as well as in the loose piece removed was bevelled off to a thin edge. This edge in the skull was cut back with the rongeur close to the reflection of the dura, and the present size of the defect in the skull is just within the line of dural reflection. The opening which still existed in the skull is circular, with a diameter of an inch and a quarter, and corresponds to the right half of the upper portion of the occipital bone.

Examination of the cyst walls at the time of the operation showed, so far as could be determined, that the inner or right wall of the cyst was formed by the falx cerebri, which had been crowded half an inch or more towards the right of the middle plane, and was concave towards the cyst, evidently from pressure of the fluid. The lower half was apparently formed by the depressed tentorium cerebelli, and the outer and upper wall by the flattened occipital pole. All of these structures were covered by a whitish layer of tissue which was much thicker in the angles of the pyramidal cavity than elsewhere. This layer did not look like organized connective tissue, but more like the plastic lymph found in abdominal operations. It was, however, firm and intimately connected to the deeper structures. It covered all the parts to such an extent that Dr. Haynes said he could not be absolutely sure of the structures beneath it, which formed the walls of the cyst, excepting over the flattened brain, where the gyri shimmered through.

As to the origin of the cyst, it was undoubtedly traumatic. There probably was a fracture of the occipital bone such as to sever the right half of the upper portion from the rest of the bone. Undoubtedly there was a hemorrhage beneath the pericranium and also one external to and probably internal to the dura. That these two areas connected with each other through the fractured bone.

As time went on and the cyst became more definitely formed and increased in size, the segment of bone was finally separated along the fracture line from the occipital bone and along the suture line from the parietal so that eventually the fragment

was as found at the time of the operation without any connection with the rest of the skull. Of course the fragment might have been a large occipital Wormian bone. No proof one way or the other can be given at this time. In either case the formation of the cyst would be the same. While the formation of the cyst is easily explained as the result of an intracranial hemorrhage, it is not so easy to account for the fact that there was no dura beneath the loose bone, but that the outer wall of the cyst was formed by the pericranium. Further the dural reflection from the bone, as stated before, was about a fourth of an inch from the bony margin of the skull defect. The further development of the cyst was undoubtedly into the great longitudinal fissure at the left of the falx cerebri and above the tentorium in the manner as explained by the diagrams. Why this cyst should apparently be developed to the left of the mid-plane and the opening through the skull be to the right Dr. Haynes had no explanation to offer.

Dr. Haynes said he did not attempt to remove the cyst wall, which he thought would have been physically impossible, as the cyst extended forward out of sight. Neither did he attempt to see if the membrane would strip up with ease or not; he left it alone, and thought that by so doing the boy was still alive and apparently normal in all respects. The wound was closed without drainage in the hope that any excess of fluid would be taken up by the subcutaneous tissue.

During the night following the operation the patient was restless and complained of pain in his head. His temperature at one A.M. was 102.5; pulse, 78. His general condition was good. He was rational, and answered all questions. His pupils did not react to light, and his left pupil was more dilated than the right. There were no paralytic symptoms. The patient vomited once.

On October 4, five days after the operation, the patient complained of a severe frontal headache and of pain in the right leg. On this day he vomited a large amount of clear fluid. The wound at this time bulged considerably, with pulsations synchronous with the heart. Kernig's sign was present; the knee jerks on both sides were absent; no ankle clonus; no Babinski. There was slight stiffness in the muscles of the neck. A small opening was made in the lower portion of the wound, and the excess of fluid allowed to drain off. This relieved the pressure symptoms, and the boy became quiet and went to sleep. On the

following day he was comfortable, and a lumbar puncture resulted in a dry tap. On October 8 his temperature and pulse were normal; the boy was comfortable but drowsy, sleeping most of the time. The stiffness of the neck had almost disappeared; also Kernig's sign. Sluggish knee jerks could be elicited. On October 10 another lumbar puncture was done with the result of getting only a little gelatinous fluid.

On October 11 the patient complained of a severe headache, and his temperature, which was 99.5 in the morning, rose to 103

FIG. 5.

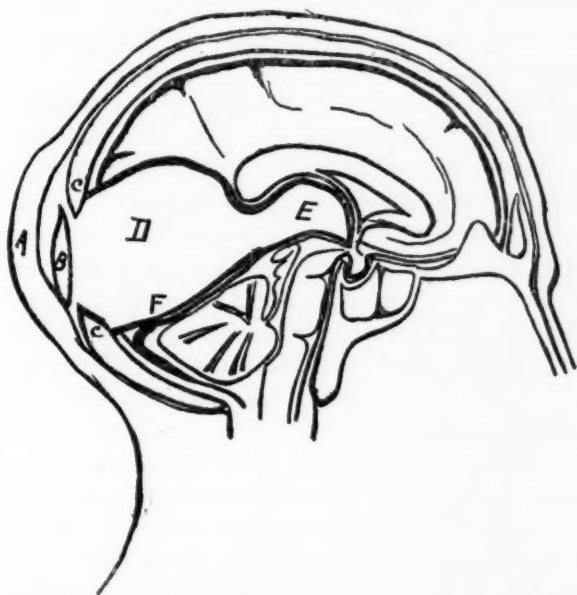


Diagram to show situation, development, and relations of cyst. *A*, bulging scalp; *B*, loose cover of bone attached only to pericranium over small area at lower inner angle; *C, C*, margins of bone, thin and devoid of both pericranium and dura; *D, E*, cyst cavity—*E*, anterior extension beneath callosum; *F*, depressed tentorium cerebelli.

in the evening. The scalp over the cranial opening was bulging. The wound was again opened at its lower end, and a considerable quantity of fluid escaped, with gradual disappearance of the compression symptoms. By the evening of October 14 there had been a gradual improvement in the boy's condition. His temperature was normal; pulse, 64. During the night he again became restless and the same train of symptoms indicating pressure appeared. An examination of the wound showed that

it was again bulging. Inasmuch as the symptoms were not urgent, Dr. Haynes decided to wait and see if the boy himself could not take care of the excess of fluid. His temperature that evening rose to 103.3. Cold sponging and enemas were resorted to with good effect, and the patient slept quietly during the greater part of the night. He gradually improved under the let-alone policy, and by October 21 his temperature fell to normal and had been so ever since. The wound remained depressed when he was in the upright position, but after lying down for a time it was flush with the rest of the scalp (Fig. 2). The boy's condition now seemed to be normal, and he made no complaint provided he could get a nap in the afternoon; otherwise, he complained of a headache.

This case, Dr. Haynes said, was unique in the following particulars: (1) The existence for ten years of a very large cyst, causing great compression of the left occipital portion of the brain, with very few and slight symptoms. (2) That the external wall of this brain cyst was the pericranium. (3) That a slight traumatism sufficed to start up an active secretion of fluid in the cyst and cause the symptoms. (4) That after external relief on two occasions, the boy's system had apparently adjusted itself to taking care of the excess of fluid, so that for over two weeks he had had no further symptoms of compression.

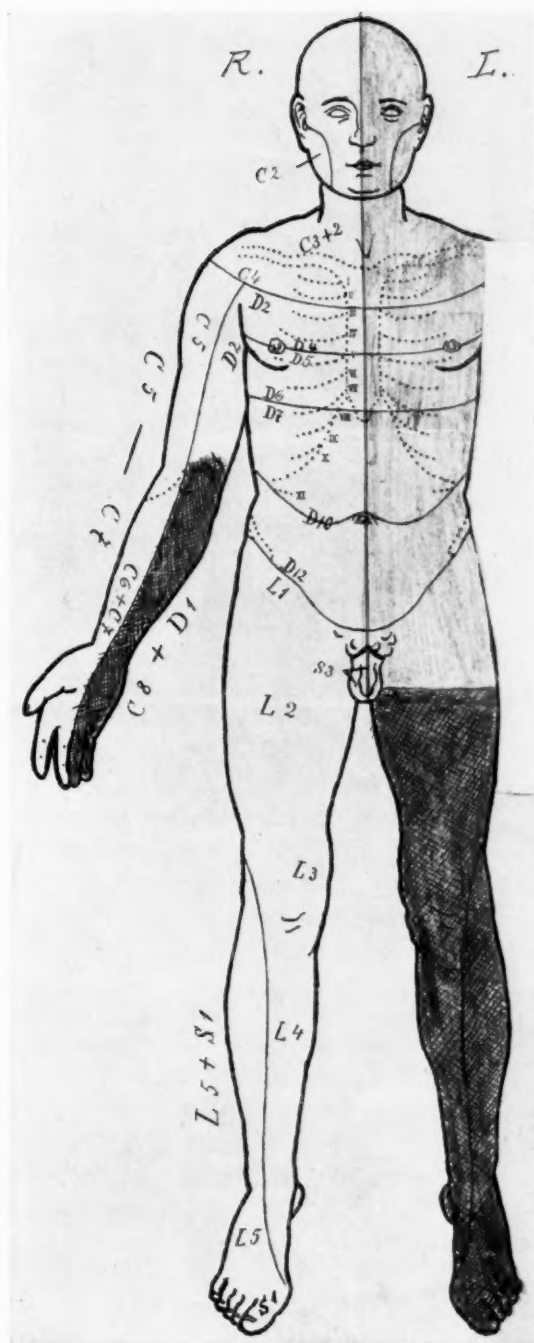
DR. WILLIAM M. LESZYNSKY, who had examined the patient shown by Dr. Haynes, said that from a neurological stand-point the boy was absolutely normal with the exception of a right lateral hemianopsia of the homonymous type, which indicated that the lesion was limited to the cuneus in the left occipital lobe.

#### NEUROFIBROMA OF THE BRACHIAL PLEXUS: RESECTION.

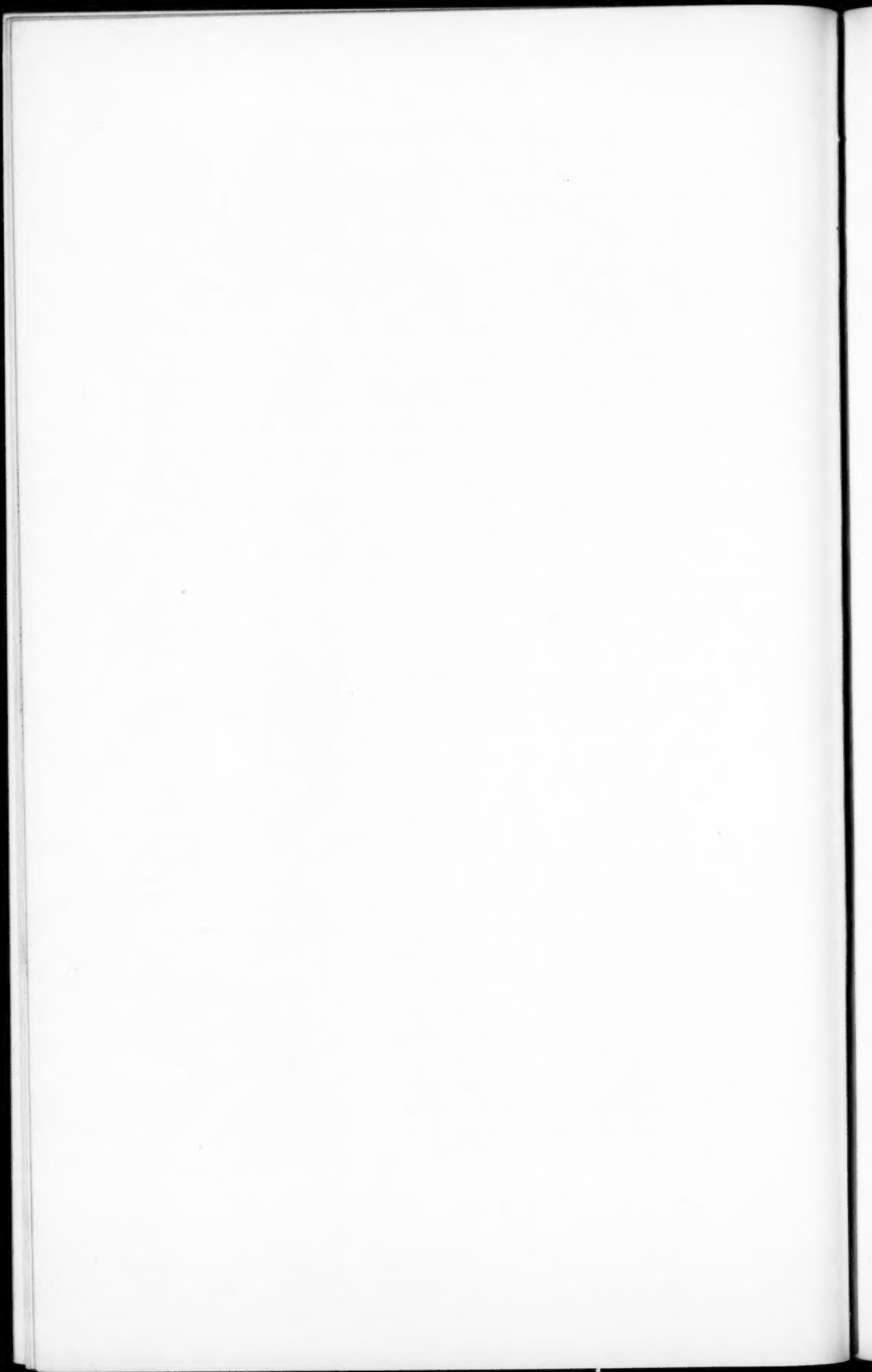
DR. HAYNES presented a man, 22 years old, who was admitted to the Harlem Hospital on October 16, 1910, with the history that two years ago he fell a distance of eighty feet, landing on his left arm. He was unconscious for three days following the fall, but his physician told him that his only injury was a broken elbow. He had no scalp wounds nor symptoms of intracranial injury. For the first few weeks after the injury his elbow improved and was apparently healing, but it seemed to be distorted, and within six months the injured elbow began to be swollen and painful. It was found to contain pus, and was opened and drained. Fol-



FIG. 6.



Showing area of anaesthesia on right upper extremity, and of hemianæsthesia upon the side on which the arm had been amputated.



lowing this he had two operations for the removal of dead bone, and subsequently the arm was amputated above the elbow. The stump became infected, but healed within a few weeks.

One year after his injury the muscles of the stump began to contract, and finally there was a continuous clonic spasm of the muscles. Because of this, the arm was re-amputated one year ago at the shoulder. Following this second amputation, he was free from any muscular contraction for the next six months, when a contraction of the muscles about the shoulder was noticed. This rapidly increased in severity until there were continuous clonic spasms of these muscles, accompanied by severe pain. About six months ago he was operated on for the relief of this condition, and he was told that certain nerves in the neck were cut. This operation gave him relief for only a few weeks, when the spasm and pain returned the same as before.

Because of the continuous pain and twitching, his general health became affected: he was unable to sleep at night; he lost his appetite, grew thin, and was at times hysterical.

On September 10, 1910, he was first admitted to the Harlem Hospital, where he sought relief because of his general rather than the local condition. His symptoms then were suggestive of typhoid fever, but his temperature, which was at first 102, soon dropped to normal, and he left the hospital on October 16. He returned the same evening, saying that he was too weak and miserable to go about his work. His symptoms were about the same as at the time of his previous admission, *i.e.*, weakness, lassitude, slight fever, occasional nausea and vomiting, and severe headache. There were no positive indications of typhoid, and a physical examination failed to show any abnormalities other than a constant clonic spasm of the muscles about the shoulder, the serratus magnus showing the most severe spasm. Under general treatment, diet, catharsis and antipyretics, his temperature soon reached normal.

Operation, October 22, 1910, by Dr. Haynes: An incision was made on the outer aspect of the neck across the middle of the clavicle, which was sawn through, down to the end of the stump. The brachial plexus was readily found, and if it had already been once severed it had evidently united and showed no evidences that any of its cords had been divided. The nerves were exposed up to their exit from the spine. Involving all but the one or two

upper nerves was a large, dense, hard mass which cut a good deal like ordinary gristle. The entire brachial plexus was severed as deeply toward the spine as possible, and then the distal portions of the nerves, with the included atrophied subclavian vessels, were removed to their distal attachment or distribution. Hemorrhage was arrested, the fragments of the clavicle were approximated by a kangaroo suture through the subclavian muscle, the space drained through a stab-wound at the posterior axillary line, and the wound closed.

Recovery from local pain and spasm of the shoulder muscles was immediate. The wound healed by primary union, and the patient said he felt in better condition than he had since the original injury.

DR. LESZYNSKY said that in this case nothing was to be found bearing upon the neurofibroma excepting an area of anæsthesia on the right upper extremity which corresponded with the eighth cervical and first dorsal segments. In all probability there was a neurofibroma involving the posterior roots entering these spinal segments.

An interesting feature of the case was that the man had a hemianæsthesia upon the side on which the arm had been amputated; this dated back to the time of his fall, two years ago, and was apparently a manifestation of traumatic hysteria. It was accompanied by concentric contraction of both fields for white and form. The speaker emphasized the importance of a careful study of the cutaneous sensibility in cases of this character; unless this was done, the condition might readily escape recognition.

DR. HENRY H. M. LYLE mentioned a case of injury to the brachial plexus in a man who was struck by a fly-wheel, necessitating a resection of the plexus and amputation of the arm. This was followed in the course of time by severe spasm in the stump.

Characteristic oculopupillary signs were present on the affected side showing an intravertebral lesion of the posterior roots.

#### FOUR CASES OF RENAL CALCULUS.

DR. ALEXANDER B. JOHNSON presented an Italian cabinet maker, 31 years old, married, who was admitted to the New York Hospital on July 26, 1910, complaining of pain in the left lumbar region. The patient gave a history of having had three attacks of gonorrhœa, the last seven years ago.

His present trouble began some four or five years ago, with occasional attacks of colicky pain in the left flank. There was no radiation of the pain at this time. The attacks at first came on every two or three weeks. He noticed that during these periods his urine contained a fine, sandy material, together with some pus. Urotropin had been prescribed by his physician, and seemed to give some relief during the attacks. The attacks gradually became more frequent and severe, and at rare intervals there had been similar pain in the right flank. Seven months ago he had an extremely severe attack in which the pain was localized in the left flank. The patient was doubled up with pain for some hours. After the passage of a small stone per urethram the pain subsided. For the past two months there had been a constant cutting pain in the rectum and left testis, and twice within this period the patient had noticed blood in his urine. He further stated that for a period of a year and a half he had visited a hospital in this city about once a month, where the pelvis of his left kidney was washed out.

The patient was fairly well nourished and developed, and in good general condition. The abdomen was soft; there were no tenderness nor masses. No pain on deep palpation over the kidney areas. The X-ray showed a shadow in each kidney. The patient's output of urine averaged 45 ounces in twenty-four hours. It contained a very faint trace of albumin, many triple phosphates and a few pus cells.

Operation, August 1, 1910: The kidney was delivered through a transverse elliptical incision, and the stone was located with a hat-pin probe. The kidney was then split longitudinally, and the stone delivered with forceps. It was fish-tailed in shape, with a serrated border, calcareous in consistence and whitish in color. After the operation, the patient ran a rather high temperature for a week, when it gradually subsided. On the night of the fourteenth day after operation, the patient voided about twenty ounces of bright red fluid, and the next day his temperature rose to 104. It fell to normal within 24 hours, and his further convalescence was uneventful. The wound healed *per primam*, and the patient left the hospital on the twenty-first day. At that time his urine contained a small amount of pus; no blood. The daily quantity of urine had increased, and frequency was about as before. He was entirely free from pain.

This patient was re-admitted to the hospital on September 28, 1910, complaining of pain in the right flank, radiating downward along the course of the inguinal canal toward the right testis. The history he gave was that five days prior to his admission he was awakened by a cutting pain in the right flank. The pain was extremely severe, causing him to perspire freely, and to vomit once or twice. It gradually became less severe, becoming dull in character and radiating downward into the right testis. He had occasional chilly sensations followed by fever. No blood had been noticed in the urine. Upon examination, no tenderness nor mass could be made out in the right flank. The X-ray showed a shadow in the right kidney.

During the five days that the patient was under observation in the hospital prior to operation, his urinary output averaged 60 ounces in 24 hours. It was alkaline, with a specific gravity of 1020, clear, amber, containing a faint trace of albumin, many leucocytes and epithelial cells and triple phosphates. No blood nor tubercle bacilli. From four to eight ounces were voided at intervals of from two to five hours during the day.

At the operation, which was done on October 3, 1910, the technic followed was similar to that employed on the opposite kidney. The kidney was exposed and opened, and a fish-tailed stone, slightly smaller than that found in the left kidney, was removed. The patient's convalescence was practically uneventful, and since the second operation there had been no recurrence of the pain in either flank.

Dr. Johnson's second case of renal calculus was that of a man, 20 years old, single, a clerk, who was admitted to the New York Hospital on July 24, 1910, complaining of a sharp, shooting pain in the right flank. His family history was negative, as well as his past history, with the exception of an operation for the removal of the appendix two years ago. That operation had failed to relieve the pains of which he complained. He had a urethritis seven weeks ago.

The patient's present trouble began about four years ago with a sharp, shooting pain in the right flank, often beginning at a point about two inches below the costal margin in the midclavicular line, and radiating backward along the costal margin to the spine. There was no radiation downwards. These attacks came on at night at intervals of two or three weeks, and lasted from a



few seconds to half an hour. The pain had never been severe, and there was no history of vomiting nor sweating. The patient had not noticed any increase in frequency of micturition, nor had any blood been noted in the urine.

Upon examination, the patient's general condition was found to be excellent. The abdomen was soft, and there was moderate pain on deep pressure over a point two inches below the costal margin in the midclavicular line, and at a point posteriorly two inches to the right of the spine, just below the level of the twelfth rib. There was no palpable mass. An X-ray picture showed a shadow in the right kidney.

On admission, the patient's temperature was 98.6; pulse, 88; respirations, 26. His average output of urine was 36 ounces in twenty-four hours. It had a specific gravity of 1020 and contained a faint trace of albumin and many leucocytes and epithelial cells. No blood nor tubercle bacilli.

Operation, July 30, 1910: The kidney was exposed and opened as in the previous case, and a flattened, mahogany-colored stone, about half an inch long, together with three smaller ones about the size of grape seeds, were removed. The smaller calculi were sharp-pointed.

Aside from a slight rise of temperature after operation, and considerable abdominal distention for some days, the convalescence was uneventful. The wound healed *per primam* excepting at the point of packing. The amount and frequency of urination remained as before operation. The patient was discharged on the sixteenth day, free from pain.

Dr. Johnson's third case of renal calculus was in a school-girl, 13 years old, who was admitted to the New York Hospital on August 17, 1910, complaining of pain in the left flank. Her family history was negative. The patient stated that she had kidney trouble about two years ago, but could not give any details regarding her attack save that she was much distended. Her present trouble dated back to her second year, when she began to have attacks of sharp, cutting pain in the left flank. These occurred at intervals of two or three months. The pain did not radiate, but had always been localized in the left flank. Recently these attacks of pain had been more frequent and severe, coming on every day or so. She had never had chills nor attacks of vomiting with the pain. There had never been blood in the

urine, nor any increase in frequency of micturition. Urination had never been painful.

The patient, upon admission, was in good physical condition. The abdomen was soft; there were no masses, and no tenderness could be elicited. The urine was clear, amber, acid, with a specific gravity of 1016; it contained neither albumin nor sugar.

Operation, August 18, 1910: The kidney was exposed and opened in the same manner as before described, and a rough, dark-colored stone, about one-quarter inch wide and three-quarter inches long, was removed. The patient's convalescence was uneventful, and she left the hospital on the fifteenth day free from pain.

Dr. Johnson's fourth case of renal calculus was that of a man, 27 years old, an elevator operator, who was admitted to the New York Hospital on August 24, 1910, complaining of pain in the left flank and radiating down into the left scrotum. His family history was negative. On July 25, 1910, he had submitted to an operation for chronic catarrhal appendicitis. Upon his recovery from this operation he still complained of occasional severe attacks of pain in the left flank. There was no history of blood in the urine at that time.

The patient stated that since early childhood he had suffered from occasional attacks of severe pain in the left flank, radiating downward into the left testis. The pain had always been severe and cramp-like in character, doubling him up, usually lasting a few minutes and then gradually passing away. There was no history of vomiting nor fever. Formerly the attacks occurred once or twice a month, but since his operation for appendicitis they had increased in severity and frequency, sometimes occurring several times during the day. Recently there had been a burning pain in the penile urethra on urination, with a diminution in the quantity of urine passed. There was no increased frequency.

The patient, on admission, was well developed and nourished. His abdomen was soft and no masses could be felt. There was extreme tenderness in the left flank over the kidney area, both anteriorly and posteriorly. The kidneys were not palpable. An X-ray, which was taken prior to his discharge after his operation for appendicitis, was negative. A second one, taken just prior to his present admission, was positive, showing a shadow in the left kidney area.

On admission the patient's temperature was 98.4; pulse, 90;

respirations, 20. The urine was clear and amber, acid, with a specific gravity of 1020, and contained neither albumin nor sugar.

Operation, August 25, 1910: Technic as before described. A stone about the size of a bean was removed from the upper part of the renal pelvis. The patient's convalescence was uneventful, and he left the hospital on the eighteenth day. He was then still rather weak and anæmic, but free from pain.

Dr. Johnson said that in all of these four cases the kidney was found to be practically normal. The stones, evidently, had not caused any serious change in the kidney substance in spite of the fact that they had been there for a long time.

DR. CHARLES N. DOWD asked Dr. Johnson what success he had had in removing stones through the pelvis of the kidney. Personally, he had done this several times with better success than through the cortex.

DR. JOHNSON said that under favorable conditions the removal of a stone through the pelvis of the kidney was a very proper procedure, but it was one that could not always be executed with perfect safety nor satisfaction. We could not always tell in what part of the pelvis or in which of the calices the stone lay. He recalled one such case where a small stone was located in the pelvis, where it could be felt very distinctly. Wishing to free the kidney a little more, he let go of it for a moment and he subsequently lost trace of the stone and found it had slipped into one of the calices and could not again be located until the kidney itself was incised. Another point to bear in mind was that we may be dealing with multiple calculi, some of which were not shown in the X-ray plate, and could only be located by careful palpation or incision of the kidney itself.

In answer to a question, Dr. Johnson said he always delivered the kidney sufficiently to get hold of the pedicle between his fingers. A clamp could then be applied, which would not only fix the organ, but at the same time control the hemorrhage.

#### THREE CASES OF UNILATERAL LAMINECTOMY WITH DORSAL ROOT SECTION FOR THE RELIEF OF SPASTIC DIPLEGIAS AND HEMIPLEGIAS.

DR. ALFRED S. TAYLOR presented a boy whose case was originally one of cerebral diplegia, with increased knee jerks, Babinski and the typical "scissor" gait. Dr. Taylor did a unilateral laminectomy and divided the last dorsal and portions of

the posterior lumbar roots on the left side. Since then the patient had received regular physical training to correct the inco-ordinate movements which remained in these cases after operation, and which were doubtless remnants of the former vicious excessive reflex action, perpetuated through mental conscious or unconscious association. Under this system of training the boy had made considerable definite progress. He was able to walk with head and trunk erect and keep his arms by his side. He walked with a narrower base than formerly, although the side swaying continued. His gait was much better when walking slowly than when his pace was quickened. The patient's self-confidence had greatly increased, and his ambition had been aroused. This being the first case of the series, only a few roots were divided to see what the trophic and functional results might be.

Case II was that of a boy, 18 years old, whose right side had been paralyzed from birth. The case was one of infantile cerebral hemiplegia. He had had epilepsy since he was eight months old. At first his attacks were truly hemiplegic, beginning in the arm on the affected side. The whole body was affected. The right arm was spastic in the shoulder, arm, forearm and hand. Permanent contractions of the abductors of the arm, biceps, and long flexors of the fingers were present. The shoulder and arm were the seat of a mild grade of athetotic movements.

An operation was done on November 15, 1909, by Dr. Taylor, to overcome the spastic state and to note the influence of such operations upon the epilepsy and athetosis. Spinal hemilaminectomy was done, the posterior cervical nerve roots from the fourth to the seventh, inclusive, being resected. No specific anæsthesia followed the operation. All spasticity was removed, but the athetotic movements were increased for ten days after the operation; then they disappeared entirely, and they were still absent in large part. As to the effect of the operation on the boy's epilepsy, there was a record of 41 fits in 1907; 51 in 1908. In 1909, up to the date of the operation in November, he had had 160 attacks; since then the number had been reduced from fifteen per month to six per month without the aid of bromides. The violent and explosive laughter to which the patient had formerly frequently given way had also been modified in character. The patient was under physical training and orthopædic care for the contractures of the arm.

Case III was that of a boy, 18 years old, who was a typical example of an infantile hemiplegic. The left arm and leg were moderately undeveloped, the left forearm was contracted on the arm at an acute angle, and the hand was flexed at more than a right angle on the wrist. The fingers were in extension, and could just be moved. The patient was feeble-minded.

On November 8, 1909, Dr. Taylor did a unilateral laminectomy and resected the posterior cervical nerve roots from the fourth to the seventh, inclusive. By the operation the arm was entirely freed from spasticity, and if the permanent contractions could be overcome it would doubtless assume its natural and normal position. Under physical training and orthopædic appliances, the arm had improved, and the patient was now able to move his fingers, although the muscles had lost all power of contraction.

Dr. Taylor said the most interesting feature of these cases, from a surgical stand-point, was the freedom from injury or deformity of the spinal column as the result of the unilateral laminectomy. The spinal column at present showed no lack of flexibility, either anteroposteriorly or laterally. The speaker stated that as the result of his experience he was convinced that it was not necessary to divide all the posterior roots in order to relieve the spasticity in these cases; on the contrary, only a part of the sensory roots had to be divided, and by doing this we relieved the spasticity without the danger of producing ataxia or trophic disturbance.

These three cases, Dr. Taylor said, were from the service of Dr. L. Pierce Clark, who had shown them at a meeting of the New York Neurological Society last spring.

#### ENDOTHELIOMA OF THE SOFT PALATE.

DR. TAYLOR presented a woman, 29 years old, who, when she came to the Vanderbilt Clinic in 1901, gave a history that for several months she had felt a small lump on the right side of the soft palate. This had never caused her any pain, and she was simply conscious of its presence by the tongue impinging on it. The growth at that time was about the size of a hazel-nut; it was excised without much hemorrhage and the wound healed very satisfactorily. The pathologist reported that the growth was an endothelioma. It recurred in August, 1902, and was again removed, both operations having been done under cocaine anæsthesia.

There was a second recurrence in February, 1904, and at this time the growth was located a little further forward and slightly involved the periosteum. It was again removed, this time under chloroform, and after this operation an aperture, about 2 cm. in diameter, was left in the soft palate. This diminished in size within a reasonably short time until it was scarcely perceptible.

In October, 1904, about eight months after the last operation, a small recurrence was noticed, this time on the hard palate. The entire old scar was removed, the periosteum was dissected well forward on the hard palate, the growth was excised within a safe margin, and a thorough application was made with the Paquelin cautery. This operation left a hole in the soft palate about an inch and a quarter in diameter, which also closed satisfactorily within a short time. Since that operation, a period of over six years, there had been no further recurrence. In every instance the recurrent tumor was pronounced an endothelioma.

FRACTURE OF THE TRANSVERSE PROCESS OF THE SEVENTH  
CERVICAL VERTEBRA, WITH PARALYSIS OF THE  
EIGHTH CERVICAL AND FIRST DORSAL NERVES.

DR. TAYLOR presented a young man, 20 years old, who had always been in good health, and whose family history was unimportant. On September 11, 1910, while riding in a velodrome on a motor cycle going about 60 miles an hour, he was thrown off, and while in the act of getting up he was struck on the head, neck and shoulders by an oncoming motor cycle and was rendered unconscious.

Soon after the accident his pulse was 150, small and thready; the left pupil was dilated and did not react to light; the right was contracted. There was neither bleeding nor escape of cerebrospinal fluid from the ears or nostrils. The sixth and seventh ribs on the left side were fractured in the midaxillary line. This was followed by extensive cutaneous emphysema and hydropneumothorax. There was retention of urine, which persisted for three days, and a low muttering delirium for two weeks following the accident.

On the fourth day after the injury it was noted that he did not use his left arm. On the sixteenth day he was well oriented as to place and person, and complained of pain in the arm. An examination made on the thirteenth day showed loss to all forms of sensibility over the areas supplied by the seventh and eighth



cervical and the first dorsal spinal roots. There was weakness of the triceps, the extensors of the wrists and fingers, the pronators, pectoralis major and latissimus dorsi; paralysis of the long flexors of the wrist and fingers, the muscles of the thenar and hypothenar eminences, and the flexor carpi ulnaris. The sensory symptoms referable to the middle trunk cleared up rather rapidly, and were probably due to a very slight pressure interference which did not persist.

A skiagram, taken on September 30, 1910, by Dr. C. F. Baker, showed a fracture of the transverse process of the seventh cervical vertebra, with downward displacement of the fragment. At this time the patient began to complain of severe cramps in the affected muscles. Before operation the persisting symptoms were characteristic of the lower arm type of brachial plexus palsy, or Klumpke's paralysis. With these were associated well-marked symptoms of palsy of the sympathetic fibres.

Operation by Dr. Taylor on November 1, 1910: Upon dissection of the brachial plexus, just above the eighth cervical root, one could feel a small, loose fragment of bone which had been depressed upon that root. The first dorsal root was not injured, so far as could be judged, and the fifth, sixth and seventh cervical roots were also normal.

The loose fragment of bone was dissected out between the seventh and eighth cervical nerves, and it was found necessary to carry the dissection behind the entire brachial plexus to avoid doing injury to the roots of the plexus. The fragment was finally enucleated, and the operation was followed by considerable relief from the painful muscle cramps which the patient had experienced.

#### SARCOMA OF THE TENDON SHEATH OF THE FLEXOR LONGUS POLLICIS MUSCLE.

DR. JAMES I. RUSSELL presented a woman, 32 years old. She was married, and her occupation was that of a seamstress. Her family history as well as her past history had no bearing on her present illness.

Three and a half years ago, after the patient had been ironing all day, she noticed a round, reddish spot on the right thenar eminence. It did not cause her any pain, but the hand felt tired. This redness persisted for about a week, and within that time a

swelling developed, followed within six months by similar but smaller hard nodules on the palmar aspect of the phalanges of the thumb. No other nodules formed until two years ago, when one appeared on the flexor surface of the wrist just above the annular ligament. There had at no time been any pain or inflammation, and the patient had used the hand regularly, suffering from mechanical inconvenience only. Examination showed that these tumors were very hard, and not tender. They moved freely, and were apparently not intimately attached to the tendon sheaths. The skin rode freely over them.

Operation: An incision was made beginning at the fold between the phalanges and carried upward along the course of the flexor longus pollicis tendon to the base of the thenar eminence. The skin and subcutaneous tissues being retracted, the largest of the tumors was dissected away from the surrounding tissues, and removed with the tendon sheath, with which it was intimately connected. By raising the skin, the small nodule on the palmar surface of the distal phalanx and one somewhat larger on the ulnar side of the proximal phalanx were removed. A second incision was then made, beginning opposite the upper border of the annular ligament and carried up the forearm one inch. The flexor longus pollicis was located and the nodule dissected away from it, the sheath being also removed, and a few small nodules lying on the tendon sheath were removed from beneath the annular ligament between the two incisions. The wounds were closed with silk sutures, and two rubber tissue drains were inserted. The patient's recovery from the operation was uneventful. The pathologist reported that the growths belonged to the type of mixed-cell sarcomata.

#### SARCOMA OF THE HUMERUS.

DR. WILLIAM B. COLEY presented a man, 30 years old, who was referred to him on June 15, 1910, by Dr. J. M. T. Finney and by his family physician, Dr. W. A. Fisher, both of Baltimore, Md., with the history that he had received an injury to the left shoulder two years ago. On December 30, 1909, he sustained a spiral fracture of the humerus at the junction of the upper and middle third. Union took place in the usual time, but severe pain persisted. On May 25, 1910, an X-ray showed what appeared to be a sarcoma in the upper end of the arm and extend-

ing to the head of the humerus. The case was referred to Dr. Finney, who curetted the new growths.

When Dr. Coley first saw the patient, on June 15, 1910, the upper third of the left humerus was markedly enlarged, and at the junction of the upper and middle third there was evidently a pathological fracture, giving a well-marked flail joint. On the anterior and inner aspect there was a recent cicatrix five inches long, in the centre of which there was a large opening extending into a cavity the size of a goose egg, which was packed with gauze. The clinical appearance was that of a bone sarcoma which had been partly removed by curetting. The X-ray photograph showed unmistakable evidence of sarcoma of the humerus, with marked enlargement of the bone and destruction of a large part of the osseous structure. The disease, apparently, extended up to the head of the humerus. The patient had practically no power in the arm, and suffered great pain.

Dr. Coley immediately put him on the mixed toxins of erysipelas and *Bacillus prodigiosus*, and after three treatments the severe pain, which had prevented him from sleeping more than two or three hours at night, entirely disappeared and has never returned. The injections were made chiefly into the pectoral region, but every third or fourth time into the tumor itself. The latter injections, in doses of four or five minims, usually produced a chill, followed by a temperature of 103 or 104. The highest dose given in the pectoral region was nine minims.

The effect of the treatment upon the tumor was shown by a slow but steady decrease in the size of the humerus at the site of the growth. The large cavity gradually filled up with new tissue. The shell of bone surrounding the tumor, which at the beginning of the treatment was entirely broken across, gradually became harder by the new formation of bone, and in two months firm union had occurred.

Early last August, Dr. Coley said, he allowed the patient to return to Baltimore, where the treatment was continued by Dr. Fisher. In September the granulations increased and assumed a sarcomatous type. These were curetted, and an examination of the tissue removed showed it to be spindle-celled sarcoma. The patient returned to New York by the middle of September and was under treatment by Dr. Coley and his associate, Dr. Gillespie, for a period of three weeks, most of the injections

being made into the arm. A third X-ray picture was taken, which showed increasing new bone formation of more normal appearance. The cavity was much smaller than at first, and the granulations seemed healthy.

On October 7, 1910, after all treatment had been suspended for about two weeks, Dr. Fisher again found the granulations suspicious and made another curettement. Microscopical examination of the tissues removed on these three different occasions showed the same type of sarcoma (spindle-celled). The examinations were confirmed by Dr. James Ewing, of the Cornell Medical College, whose report reads as follows:

"The tumor has the general structure of a large, spindle-celled sarcoma. Some portions of the tumor are very rich in cells which are most abundant about irregular blood sinuses, and they are often arranged in interwoven bundles after the manner of smooth muscle bundles. The cells are mostly of long, plump, cylindrical form, but many are short and nearly round, and some of these round cells are of giant size, with huge multilobed nuclei. Mitoses are abundant. In some oedematous areas all the cells are round and hydropic, and when the cell bundles are cut in cross section, they appear round and resemble the cross section of smooth muscle. In the cellular areas the stroma is scanty or absent; elsewhere it is abundant and often hyaline. There are considerable areas of fibrosis, and some portions are necrotic. The histological appearance indicates considerable malignancy. The diagnosis is large, spindle-celled sarcoma, with giant cells, and the origin is very probably from muscle."

The patient returned to Dr. Coley on October 15, and the toxins were resumed in as large doses as could be tolerated without too much depression. Under this treatment the cavity finally healed by healthy granulation, the arm had almost fully recovered its normal function, and the patient's general health was good.

A ROUND-CELLED PERIOSTEAL SARCOMA OF THE FEMUR INVOLVING THE LOWER TWO-THIRDS OF THE SHAFT, WITH EXTENSIVE PECTORAL AND ABDOMINAL METASTASES; WELL EIGHT AND A HALF YEARS AFTER TREATMENT.

DR. COLEY showed this patient, who had been treated with the mixed toxins of erysipelas and *Bacillus prodigiosus*, and who was well eight and a half years after treatment. The patient

had been referred to him by Dr. Wisner R. Townsend of the Hospital for the Ruptured and Crippled, on February 5, 1902. Physical examination at that time showed a large tumor occupying the entire lower two-thirds of the left femur. It was fusiform in shape, with its largest circumference just above the condyles. A portion of the tumor was removed under ether anæsthesia, and found to be a periosteal sarcoma. The diagnosis of sarcoma was confirmed by microscopic examination made by Dr. E. K. Dunham, Director of the Carnegie Laboratory, Professor of Pathology at the Bellevue University Medical School and Pathologist to the General Memorial Hospital, and also confirmed by Dr. B. H. Buxton, of the Loomis Laboratory and the Cornell Medical College.

Hip-joint amputation was strongly urged, but refused by the patient and his parents. Under prolonged X-ray treatment, there was at first some diminution in the size of the growth, but in the fall of 1902, the patient developed a metastatic tumor in the left pectoral region; this was six inches in diameter and two inches in thickness. About the same time a large tumor, the size of a child's head, developed in the iliolumbar region on the right side; this filled the entire iliac fossa, and extended up to the ribs, being probably connected with the ilium. The patient was then put upon large doses of the mixed toxins for the first time. In about four weeks the tumor in the iliolumbar region began to soften and break down. Under ether anæsthesia an incision was made in the lumbar region and a large quantity of necrotic tumor tissue, between a pint and a quart, was evacuated. A tube was kept in for a long time, and more or less drainage continued for nearly a year. The patient's general health began to improve, and the tumor involving the femur slowly decreased in size.

This patient, Dr. Coley said, had remained in perfect health up to the present time, a period of over eight years. Examination at present still showed a certain amount of thickening of the left femur, and a very marked X-ray dermatitis, which, from time to time, showed areas of ulceration.

Dr. Coley said that a cure of a subperiosteal sarcoma of the femur, even by hip-joint amputation, was exceedingly rare. Butlin found only one cure in 68 cases of hip-joint or high amputation. The case reported was of added interest from the fact

that it was the only case on record of periosteal sarcoma of the femur with extensive metastases cured by any method of treatment.

#### TUMORS OF THE HAND AND FINGERS.

DR. WILLIAM DARRACH read a paper with the above title.

DR. COLEY recalled the five following cases of malignant tumors of the fingers or hand that had come under his personal observation.

Case I, which had already been referred to by Dr. Darrach, was a sarcoma of the metacarpal bone immediately following a trauma. The arm was amputated three months after the injury. General metastases in the breast and liver occurred four weeks later, and death six weeks afterwards.

Case II was a round-celled, periosteal sarcoma of the ring finger in which the tumor was imperfectly removed, it being thought that it was a fibroma. A microscopical examination made by Dr. William Welch, of the Johns Hopkins University, proved it to be a highly malignant periosteal sarcoma. Before amputating the finger, it was decided to try the mixed toxins, which were given, chiefly systematically, for four months. The tumor disappeared, and the patient was now well more than ten years.

Case III was a spindle-celled sarcoma on the hand of a girl twenty years of age, originating in the fascia. The tumor was removed, but recurred. It then disappeared under the mixed toxin treatment and the patient remained well for about two and a half years, when it recurred locally and grew very rapidly. Amputation was at once advised, but the patient refused and took Christian Science treatment for eight months, at the end of which time the hand had attained the size of a cocoanut. She then returned for amputation, which was done, but which did not prevent death from general metastases two months later.

Case IV was a central sarcoma of the giant-celled type involving the little finger of a woman about 50 years of age. The growth was the size of an English walnut. The finger was amputated, and the patient was well when last heard from, about ten years later.

Case V was a melanotic sarcoma starting about the thumb-nail immediately following an injury to the thumb caused by a heavy office curtain cord bruising it. The swelling was at first supposed to be an abscess, and was lanced. Later, it was removed by



operation. A few months later a number of small subcutaneous melanotic tumors appeared in the forearm and arm, and within the next year hundreds of tumors appeared in different parts of the body, the patient finally dying from a metastatic growth involving the spine.

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*Stated Meeting, held November 23, 1910.*

The President, DR. ELLSWORTH ELIOT, JR., in the Chair.

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EPITHELIOMA OF THE NOSE OPERATED ON UNDER INTRA-  
TRACHEAL INSUFFLATION ANÆSTHESIA.

DR. NATHAN W. GREEN presented a man, 78 years old, who was operated upon by Dr. H. H. Janeway and himself for an extensive epithelioma involving part of the left and practically all of the right side of the nose, the resulting defect being covered by a skin flap taken from the cheek on the right side.

There was nothing of special interest in the operation itself, Dr. Green said, but the case was shown merely because the operation was done under intratracheal insufflation anæsthesia. This was for the purpose of giving an undisturbed narcosis, and of preventing the inspiration of blood and bloody froth into the trachea. In this respect it proved all that Dr. Meltzer had claimed for it, for much blood gravitated into the pharynx, and it seemed to be an ideal method for artificial respiration. There was no post-operative respiratory complication.

EXTENSIVE PERICYSTITIS.

DR. A. V. MOSHCOWITZ presented a man, 64 years old, who had been subjected to suprapubic aspiration of the bladder four weeks ago. On palpating the abdomen, there was found a very firm, painful, and tender mass extending from the symphysis pubis to within two inches of the umbilicus. In general, this mass had somewhat the shape of a pregnant uterus, with an upper rounded border and its sides tapering downward toward the symphysis, as if it were confined by the outer edges of the sheaths of the recti. It could also be made out that this large mass was intramural and not intraperitoneal. The prostate was very large, approximately the size of a large fist. The patient had a mod-

erate temperature, 100° F., and the pulse-rate was not accelerated. The mass did not fluctuate, and exploratory aspiration at one point was negative.

From the history and physical signs, Dr. Moschcowitz was of the opinion that he was dealing in this case with an extensive cellulitis of the space of Retzius, the infection being of a low degree of virulence. For the present, the treatment was expectant. If suppuration became evident, an incision would be made.

PISTOL-SHOT WOUND OF THE ARM, WITH INJURY TO THE  
MEDIAN NERVE AND THE DEVELOPMENT  
OF A FALSE ANEURISM.

DR. VOSBURGH presented a man, who was admitted to Bellevue Hospital in the service of Dr. Bern Gallaudet on October 7, 1908, with a pistol-shot wound of the upper arm. About a week after the receipt of his injury the arm became markedly swollen, and examination showed a pulsating tumor which was recognized as a false aneurism. This diagnosis was verified on operation, and it was also found that the median nerve had been partially divided by the bullet, *i.e.*, connective-tissue sheath intact, but nerve severed, with complete loss of function, both motor and sensory, in the distribution of that nerve. Two years after operation function is now restored, all but some slight anæsthesia over the digital distribution of the median; this without suture of the nerve, regeneration having taken place along the connective-tissue sheath.

DR. F. KAMMERER said the result in Dr. Vosburgh's case was an illustration of the fact that we should not immediately resort to suture of a nerve after injury. The speaker recalled similar cases in which the symptoms of nerve injury persisted for many months, and where non-interference resulted in perfect restoration of function. In one case of unrecognized dislocation of the head of the radius, with consequent pressure upon both branches of the musculospiral nerve, it was found, on operation three months after injury, that the nerves had been reduced to mere strands of connective tissue at the points of pressure. The head of the radius was resected and ultimate complete recovery and restoration of function took place. Where there had been an open wound at the time of the injury, suture of the nerve seemed the

rational procedure, but in cases of loss of nerve function after severe contusions, it is occasionally difficult to decide whether operation is indicated or not.

IMPERMEABLE CARDIOSPASM SUCCESSFULLY TREATED BY THORACOTOMY AND ŒSOPHAGOPLICATION.

DR. WILLY MEYER presented a woman, 47 years old, who had suffered for several years with difficulty in deglutition, with occasional regurgitation. At times, her condition was better, then worse, until she was unable to swallow even fluids. She went to the German Hospital, where an ineffectual attempt was made to pass a dilator. Sounds and X-rays disclosed the presence of a large œsophageal pouch above the cardia.

The patient was fed per rectum for a time, and later a gastrotomy was done. Her condition gradually became worse, and an attempt was made, with the aid of the ureter-cystoscope, introduced through the gastrotomy wound, to pass an instrument upwards through the cardia. This also failed.

On May 31, 1910, under differential pressure, Dr. Meyer did a thoracotomy. He made the lower half of the Schede incision, and turned the flap upwards. The pleura presented many adhesions, and upon incising it and attempting to strip it off, two tears in the lung tissue occurred. These were sutured.

Upon exposing the œsophagus, a very large œsophageal pouch was found lying directly on the diaphragm. The cardia was then drawn into the pleural cavity and palpated; there was no constricting tumor. After blunt exposure of the œsophageal pouch, a strip of gauze was passed around, in order to get a firm hold of it, when it was possible to pass a sound from the mouth through the constricted cardia, under the guidance of the hand, within the thorax. In order to avoid constricting the pneumogastric nerves, they were bluntly stripped off on each side, and the diameter of the œsophageal pouch was materially reduced by infolding its wall twice with the help of interrupted silk sutures.

During the patient's convalescence she developed a partial emphysema, which necessitated rib resection on the twentieth day. During the fourth week she developed a hæmatogenous infection of the right kidney, probably due to a cortical embolism with infection of the perirenal tissue.

Within three weeks after the operation the patient could take liquid nourishment, and was soon able also to swallow solids.

After this operation, if this spontaneous return of easy deglutition should be seen again in similar cases, it would mean a cure of this trouble with the help of thoracic surgery. So far it had been attacked by the abdominal route only (V. Mikulicz, Wendel). It would perhaps also throw some light on the etiology of the trouble, for it seems that the separation of the *nervi vagi* from the *œsophagus*, and with it the tearing of the many fine filaments that enter the wall of the *œsophagus*, might have been the principal factor in stopping the spasmodic contraction of the *cardia*.

#### PARTIAL GASTRECTOMY FOR CARCINOMA: THREE CASES.

DR. CHARLES H. PECK presented a man, 47 years old, who was admitted to the Roosevelt Hospital on March 29, 1910. He had had distress after eating for two years, with eructations, a feeling of weight, and dull epigastric pains, which were relieved by vomiting. As his symptoms increased, he vomited after each meal, the vomitus sometimes containing particles of food taken the previous day. There was no history of vomiting blood nor coffee-ground material; no tarry stools. He had lost about 55 pounds in weight during the five months prior to his admission. On March 30, 1909, an examination of the stomach contents showed a trace of blood. There was no bile; free hydrochloric acid, 10. Glycyltryptophane test positive.

As prolonged treatment by competent internists failed to give him more than temporary relief, he was operated on by Dr. Peck on March 31. An indurated growth was found at the pyloric end; this nearly encircled the stomach, with its right margin extending to within 3 cm. of the pylorus, which was free. The lymph-nodes of the pyloric group and those along the greater curvature were extensively involved, and there was a nodule in the upper border of the pancreas. No other metastases were found. The nodule in the pancreas gave rise to some doubt as to the advisability of excision of the growth, but as it was softer than the stomach growth and the lymph-nodes, its character was uncertain, and a radical extirpation was done. Partial gastrectomy was performed, with extirpation of the glands and the pancreatic nodule. The lines of section and the technic followed were those of the typical Mayo method. Posterior gastro-enterostomy by suture with the short loop was then done, and inad-

vertently the anastomosis was made in front of the transverse colon. It was of some interest to note that there had been no obstruction nor unfavorable symptoms either in the early or late convalescence of the patient, in spite of this error.

A cigarette drain was carried down to the stump of the duodenum, as its closure was difficult and not quite satisfactory. No leakage occurred. Time of operation, one hour and fifteen minutes.

The pathological report showed a very cellular type of carcinoma of the stomach, the lymph-nodes, and the nodule from the pancreas. Water by the mouth was given at the end of twenty-four hours, liquid nourishment on the third day, and soft diet on the seventh day. The patient was out of bed on the fourteenth day, and left the hospital well 25 days after operation. He was then eating regular meals without distress, his bowels were acting well, and he had begun to gain in weight. His weight on admission to the hospital was 122 pounds; he now weighs 165 pounds, has no distress after eating, and feels perfectly well.

The second patient was a man, 37 years old, who was admitted to the Roosevelt Hospital, Medical Division, in the service of Dr. Evan Evans on April 15, 1910. The history obtained was that for about one year he had suffered from pain after meals, relieved by vomiting. The vomiting usually occurred about two hours after eating, and sometimes showed particles of food eaten on the previous day. No history of blood or coffee-ground material. Stools constipated, and at times tarry. The patient had lost 54 pounds in weight in the last year, most of it during the past three months. Lavage showed marked stomach dilation and food retention. The gastric contents contained free hydrochloric acid 6, combined 30; total, 42; no lactic acid. Test for blood positive; glycytryptophane test positive.

The patient's emaciation and weakness were so marked that he was transferred to the Surgical Service as an emergency case on September 15, and operated upon at once. He was literally starving and suffering greatly from dehydration.

Upon opening the stomach, an indurated mass was found occupying the pyloric portion; the glands of both the lesser and greater omenta and the pyloric group were extensively involved, and posteriorly the mass was adherent to the pancreas. A partial

gastrectomy was performed by the usual method, with posterior gastrojejunostomy by suture. A careful dissection of the portion of the mass adherent to the pancreas posteriorly left that viscus free from gross evidence of disease. The abdomen was closed without drainage.

The pathological examination of the mass showed a very cellular, infiltrating, diffuse carcinoma of the pyloric portion of the stomach. Sections of the tissue dissected away from the head of the pancreas showed no pancreatic tissue; it was of a chronic inflammatory type, with beginning invasion of carcinoma cells. The lymph-nodes showed marked invasion of carcinoma.

An intravenous infusion and salines per rectum were given immediately after the operation, and water by mouth was allowed after twelve hours. Albumin water was commenced on the second day, and broth and milk were added on the fourth day. A soft diet was begun on the seventh day, and the patient was out of bed a week later. His weight the day before operation was 119½ pounds; on the nineteenth day after operation, when he was discharged from the hospital, he weighed 135¾ pounds.

On May 14, one month after operation, he reported that he was eating four good meals a day without discomfort, and that he felt perfectly well. His weight had increased to 151 pounds. On October 15, a mass about the size of a fist was felt in the epigastrium, evidently a recurrence in the region of the pancreas. He was beginning to have epigastric pain, and had vomited a few times. At this time he weighed 178 pounds, a loss of five pounds from a top weight of 183 pounds, which he had reached during the summer.

Dr. Peck said that this case was presented in spite of the unfavorable outcome, as an illustration of what might sometimes be accomplished in palliation by the removal of a large growth, with glandular involvement, even when the chance of ultimate cure was negligible. It was extremely unlikely that a simple gastro-enterostomy would have given the same degree of relief, even for the few months prior to recurrence.

The third case presented was a man, 48 years old, who was operated on by Dr. Peck for carcinoma of the pyloric portion of the stomach on January 4, 1910. The case had already been reported to the Society and published in the *ANNALS OF SURGERY*.



Since then the patient had remained well, his appetite was fair, he had no distress after eating, and was able to attend to his business. His weight on admission was 123 pounds, and he now weighed 129½ pounds.

PARTIAL COLECTOMY FOR CARCINOMA OF THE SPLENIC FLEXURE.

DR. PECK presented a man, 47 years old, who was admitted to the Roosevelt Hospital on September 12, 1909. He had been troubled with obstinate constipation for about three months, and for about two weeks had had distinct periods of partial obstipation of the bowels, which were relieved by the use of the rectal tube. He had had formed movements up to within the past few weeks. No blood had been noticed in the stools; there had been no loss of weight. A distinct mass was felt on deep palpation over the line of the colon just below the left costal arch.

Operation, September 13, 1909: Upon opening the abdomen, an indurated growth of the colon was found at the splenic flexure. It was somewhat fixed to the posterior parietes, and numerous enlarged glands were felt in the inner leaf of the mesocolon. The transverse colon was distended. Division of the outer leaf of the mesocolon, the phrenocolic ligament, and a part of the gastrocolic omentum allowed mobilization of the colon with the growth and glands, and rotation inwards. The descending colon and part of the sigmoid and of the transverse colon, nineteen inches in all, together with the accompanying lymph-glands, were excised. The cut ends were inverted, and a side-to-side anastomosis between the transverse colon and the sigmoid was done. A cigarette drain was left near the anastomosis, and the wound closed to the exit of the drain. The operation was difficult and prolonged, requiring one hour and forty minutes, and there was marked operative shock, for which a saline infusion was given.

Flatus was passed after the first twelve hours, and on the third day there were three normal defecations. There was a slight fecal leakage in the drainage track on the sixth day, which ceased spontaneously nine days later. The patient was out of bed on October 5, and left the hospital, well, on October 15, 1910, twenty-seven days after operation. He received daily injections of the Hodenpyl serum for a period of about three months. He is now perfectly well and attending to his business regularly. His

present weight is 184 pounds, and his average weight for the past five years was 173 pounds.

The pathological examination showed adenocarcinoma, with a good deal of associated inflammation.

#### CARCINOMA OF THE CÆCUM.

DR. PECK presented a man, 44 years old, who was admitted to the Roosevelt Hospital on February 24, 1910.

During the month prior to his admission to Roosevelt Hospital, he had tarry stools four or five times, and occasionally noticed a lump in the right iliac region. He had lost only four pounds in weight in six months.

Upon examination, a definite mass, the size of a hen's egg, could be felt in the right iliac region. It was slightly movable, dull on percussion, and non-sensitive. Blood was present in the stools on repeated examinations.

Operation, February 26, 1910: Upon opening the abdomen, the growth was found to involve almost the entire circumference of the gut at the ileocolic junction, as well as the valve itself and some of the retrocolic glands. It was reported to be a colloid carcinoma. About four inches of the ileum, the cæcum, the ascending colon, and a portion of the transverse colon, together with the mesocolic lymph-nodes were excised. The cut ends of the ileum and transverse colon were closed with purse-string sutures, a side-to-side anastomosis by suture was made, and the abdomen closed without drainage.

The patient's convalescence was uneventful. He was out of bed on the twelfth day, and left the hospital fourteen days after operation. He is now working regularly, his appetite is fair, his bowels regular, and he weighs 126½ pounds, which is a gain of seven pounds since the operation. There were no signs of a recurrence up to the present time.

#### ADENOCARCINOMA OF THE SIGMOID.

DR. JOHN A. HARTWELL presented a woman, 38 years old, who was admitted to Bellevue Hospital on October 1, 1910, with a history of increasing constipation and blood in the stools extending back over a period of about three months.

Upon examination, a tumor was made out in the abdominal region. It was about the size of a normal kidney, globular to the

feel, and dull on percussion. It was freely movable, its excursions extending from the costal margin down into the pelvis, and laterally from the umbilicus to the lumbar region.

Through a small incision, the tumor was exposed. It was found to spring from the sigmoid flexure of the colon. The entire colon was lifted out of the abdominal cavity; a triangular section of the mesocolon was then excised, together with the tumor and the involved lymph-nodes. The wound healed within eight days, and the patient left the hospital in about two weeks.

Pathologically, the growth proved to be an adenocarcinoma, while the involved glands were inflammatory in character.

LARGE INOPERABLE RECURRENT INTRA-ABDOMINAL SARCOMA FOLLOWING REMOVAL OF A ROUND-CELLED SARCOMA OF THE TESTIS A YEAR BEFORE: DISAPPEARANCE UNDER THE MIXED TOXINS OF ERYSIPELAS AND BACILLUS PRODIGIOSUS.

DR. WILLIAM B. COLEY presented a laborer, 48 years old, whose family history was unimportant, and who gave no history of trauma. He was operated upon at the Mt. Sinai Hospital in September, 1909, by Dr. A. A. Berg, who removed the left testicle for a tumor of several months' duration. A microscopical examination of the growth made by Dr. F. S. Mandlebaum, the pathologist of the hospital, proved it to be round-celled sarcoma.

About six months after this operation the patient began to have considerable pain in the left side of the abdomen. This gradually became more severe, and subsequently a large tumor developed in the left hypochondriac and lumbar regions. The patient was referred to Dr. Coley in May, 1910, by Dr. Berg, of the Mt. Sinai Hospital, as an inoperable recurrent case of sarcoma of the testicle, with a view to using the toxins. He was admitted to the General Memorial Hospital and immediately put upon the injections with the mixed toxins. The initial dose of half a minim was gradually increased up to the point of getting a moderately severe reaction, with a temperature elevation of 102 or 103, which was caused by seven or eight minims. All the injections were made into the gluteal region, and he received five to six treatments a week.

Physical examination at the time of the patient's admission showed a hard tumor about the size of a fist in the left side of the abdomen, about on a level with the umbilicus. The tumor,

which was quite fixed, apparently originated in the retroperitoneal glands.

There was a gradual diminution in the size of the tumor under the mixed toxin treatment, which was kept up until August 29, when the patient was temporarily discharged. On readmission to the hospital September 7, 1910, examination showed that the growth had apparently entirely disappeared, but the inguinal glands on both sides were still enlarged, and the treatment was resumed. On November 3, under ether anæsthesia, Dr. Coley removed the glands to determine if they were sarcomatous or hyperplasia due to the irritation of the gluteal injections. Two glands about the size of a marble were removed from the right side and one from the left, and submitted to Dr. W. C. Clark, the pathologist to the General Memorial Hospital, who reported that they were examples of simple hyperplasia, there being no trace of sarcoma. Under ether examination, no trace of the abdominal tumor could be felt. The patient was steadily gaining in weight, and his general condition was normal. Dr. Coley said he intended to continue the injections for two or three months longer, in order to render a recurrence less probable.

The case was interesting from the fact that it was the only case of sarcoma of the testicle, recurrent in the abdomen, in which the toxins, in the speaker's observation, had succeeded in causing a complete disappearance of the disease. He had had four cases of sarcoma of the testis in which he had used the toxins immediately after operation as a prophylactic; those patients had now been well over three years. He had never cured a case of sarcoma of the testis by operation alone.

#### EPITHELIOMA OF THE LOWER EYELID.

DR. COLEY presented a man, 38 years old. When Dr. Coley first saw him, February 24, 1910, he presented a cauliflower-like growth covering the entire eye, reaching up to the eyebrow, and extending from the outer to the inner canthus. Three attempts at removal were followed by recurrence. Finally, at a fourth operation done by Dr. Downs, everything back into the ethmoid cells was cleaned out.

#### OSTEOOMA OF THE UPPER END OF THE HUMERUS.

DR. COLEY, who showed this patient, said the case was of interest from the fact that the X-ray picture very closely simu-

lated sarcoma, and the probable diagnosis of malignant disease was made by a very competent X-ray specialist.

The patient, a boy of sixteen years, while exercising on horizontal bars at the gymnasium, felt a very sudden and severe pain in the upper portion of the right humerus. He went home immediately, and an examination by his brother, who was a physician, showed a hard swelling two inches from the upper end of the humerus, on the inner side. At first it was regarded as a fracture, but an X-ray examination was made and showed a bony tumor apparently originating in the periosteum and projecting about an inch from the normal surface. From the X-ray picture alone one would almost certainly pronounce it a sarcoma. Clinical examination, however, showed a very hard, nodular, bone-like swelling just beneath the axillary vessels on the inner side of the right humerus. From the extremely hard consistence of the tumor and the nodular type of the swelling, Dr. Coley said he made the diagnosis of osteoma instead of sarcoma. The growth had undoubtedly been present for a long time without having been noticed by the patient. He was sent to the General Memorial Hospital, and two days later, under ether anaesthesia, a three-inch incision was made over the anterior portion of the humerus, and carried down to the periosteum. The vessels and nerves, which lay directly over the tumor, were strongly retracted inwards until the base of the tumor was reached. This was then chiselled off on a level with the normal surface of the humerus.

The tumor proved to be a hard, bony growth, quite typical of osteoma and showing no resemblance whatever to sarcoma. The wound healed by primary union. The report of the microscopical examination made by Dr. Clark, the pathologist of the General Memorial Hospital, had just been completed. The growth was first decalcified and proved to be a pure osteoma.

#### SUPERFICIAL INGUINAL HERNIA ASSOCIATED WITH UNDESCENDED LEFT TESTIS.

DR. COLEY presented a boy, 16 years old, who was admitted to the General Memorial Hospital early in November, 1910. He had a tumor about the size of a hen's egg in the inguinal region, just above the internal ring, reaching nearly up to the anterior superior spine. The left scrotum was empty. The testicle could easily be made out, and on coughing a certain amount of omen-

tum was forced into the sac. It was clear that the testicle was covered only by the skin and superficial fascia, thus making the diagnosis of superficial inguinal hernia perfectly easy.

This patient was shown, Dr. Coley said, first, for the reason of the supposed rarity of the condition. Dr. A. A. Berg published an article on this subject a few years ago in *The Medical Record*, according to which only seventeen such cases were reported in the literature. Dr. Coley said the condition was much less rare than was generally supposed. They had operated upon fifty such cases at the Hospital for Ruptured and Crippled, and upon a large number outside of the hospital.

The second reason for showing the case was that it threw an important light upon the etiology of this subject. Formerly, Dr. William T. Bull and the speaker were inclined to regard this type of hernia, as well as the interstitial type, as due to the testicles meeting with an obstruction in the region of the external ring and following the line of least resistance, *i.e.*, upwards. In the present case there was found a bilateral sac, the one pouch extending down to the bottom of the scrotum, the other toward the anterior superior spine, the latter containing the testicle. These sacs, Dr. Coley said, he now believed to be practically always of congenital origin, and not acquired in the way formerly supposed.

The testis in the present case was easily placed in the bottom of the scrotum without sacrificing the vessels of the cord, although he did not hesitate to sacrifice those vessels in cases where cutting the fascial bands alone did not permit placing the testicle in the bottom of the scrotum. Bevan had shown the comparative safety of sacrificing all the vessels of the cord excepting those of the vas deferens.

#### ANÆSTHESIA BY THE INTRATRACHEAL INSUFFLATION OF AIR AND ETHER.

DR. CHARLES A. ELSBERG read a paper with the above title, for which see page 161. He also demonstrated the apparatus used.

DR. HOWARD LILIENTHAL said he had employed this apparatus in a number of cases, and he could indorse all that Dr. Elsberg had advanced in favor of this method of anæsthesia. It hampered and worried the operator much less than any other method of which he knew. The speaker said his experience with the method was thus far limited to six cases, one an intrathoracic operation, one for the extirpation of a goitre, and the others laparotomy



cases. He could also corroborate what had been said in regard to the remarkable rapidity with which these patients recovered from the effects of the anæsthetic; in one instance where the operation was quite prolonged, the patient, within one minute after the withdrawal of the anæsthetic, protruded her tongue upon request and gave other evidences of being perfectly conscious.

Dr. Lilienthal expressed the belief that the intratracheal insufflation method of anæsthesia would prove of enormous value in operations other than those confined to the intrathoracic cavity. It seemed particularly indicated in cases of intestinal obstruction, as it obviated the danger of fecal vomiting, with the possibility of inhaling septic material into the lung. By this method, should vomiting occur, the vomitus would be instantly expelled through the mouth. This fact, he understood, had been demonstrated on animals by Dr. Meltzer.

One difficulty that he had encountered with the method, Dr. Lilienthal said, was to introduce the tube into the trachea. The technic of this required some practice. He had seen Dr. Elsberg do it in a few seconds.

DR. S. J. MELTZER, after congratulating Dr. Elsberg upon the successful working of his apparatus and the care with which he employed the method of insufflation in operations upon human beings, said that perhaps fifteen years ago he made the observation that artificial respiration was in itself an anæsthetic measure. Others had since made the same observation; it can be demonstrated on animals. Also by the insufflation method this fact can be demonstrated; it contributes to the anæsthesia even when air alone is being used. Dr. Meltzer said he had learned recently that certain animals were more susceptible to ether than others; it had been found necessary in such cases to give them half ether and half air, or even less ether; as soon as this proportion was increased, the animal stopped breathing completely, although the circulation would remain unimpaired.

Replying to Dr. Lilienthal, the speaker said that animal experimentations had shown that there was no danger of inhaling foreign material into the lung with this method of anæsthesia. This had been demonstrated by filling the pharynx of the animal with coal dust and by producing forced vomiting, yet in spite of this the trachea remained free from foreign material as long as the insufflation was continued.

SARCOMA OF THE CHEST WALL REMOVED BY THORACOTOMY UNDER DIFFERENTIAL PRESSURE.

DR. WILLY MEYER showed this specimen, which was obtained from a man, 33 years old, with a tumor of the right chest wall extending from the sixth to the tenth ribs. It was excised under differential pressure and was found to involve the diaphragm, a portion of which had to be removed. The patient died on the morning following the operation. Secondary hemorrhage into the pleural cavity, which had been closed air-tight, was found to have been the cause of death on inspecting the wound. Pathologically, the growth proved to be an alveolar sarcoma.

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